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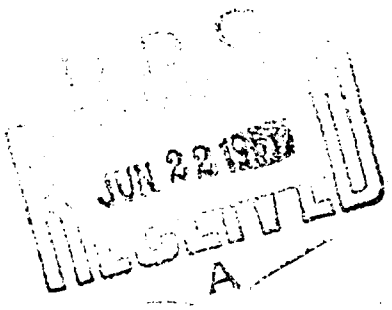
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VULNERABILITIES OF SOCIAL STRUCTURE

Studies of the Social Dimensions of Nuclear Attack

S. D. Vestermark, Jr.
Editor

With Papers by:
David M. Heer
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December, 1966

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FOREWORD

The purpose of this volume is to provide planning and operating officials with information about possible patterns of social effects and societal vulnerabilities which would result from nuclear attack on the United States. This information reveals that nuclear attack is far more than a group of immediate effects directly related to the physical characteristics of the weapons; especially in the case of massive nuclear attack, attack effects are created and expressed on the many levels of visible behavior and institutional process which comprise a complex social system. Reducing vulnerability to nuclear attack therefore requires a large range of information about especially the social processes and problems which may be created by attack.

But to make such information available to planning and operating officials, the analyst of attack effects must find some way of dealing with two interacting kinds of uncertainties: (1) the limited experience with actual effects of nuclear weapons on human society, and (2) the present state of knowledge in the social sciences, which does not permit the full description or prediction of many complex events resulting from the interactions among levels of the total set of social systems formed by society. The analytic difficulties which result from these limitations must be faced squarely. Facing up to these difficulties requires the development of the conceptual and analytic tools which will suggest interrelations among not only the thousands of potential acts of behavior in a complex society, but among the larger institutional spheres which reciprocally shape specific acts of behavior. Post-attack events as well as the life of pre-attack society must be seen as resulting from several levels of determinants. Since the proper statement of these determinants is the task of not only these studies of possible post-attack events but, more generally, of attempts to develop a social science, the individual chapters in this volume necessarily address many unresolved problems in the social sciences. Throughout the book, there is a concern with the meanings of knowledge in the social sciences and with the varieties of methods available for attaining this knowledge.

More than usual, therefore, the writers of this book openly stop to ponder methodological and philosophical questions along the way. In the strict sense, in fact, the book does not advance specific recommendations about concrete attack countermeasure systems that might be adopted by the Department of Defense and related national security and social welfare agencies. Instead, the emphasis is (1) upon trying to show how the fundamental scientific questions in projecting the social effects of attack can be approached, and (2) upon demonstrating how the necessary tools and findings that come out of the analysis point to broad categories of requirements and constraints on any generally comprehensive social countermeasure system that might be proposed. Those countermeasure systems that are proposed are to be seen primarily as illustrative.

Organization of This Book

Nevertheless, there are a number of implicit and explicit recommendations. The reader anxious to get to them should take note of the general organization of the volume.

Part I, which consists of only one chapter and its appendix, is a monograph on the general nature of the analytic task in studying the vulnerabilities of social structure to nuclear attack. It reviews the methods and conceptual tools which are available, suggests a number of ways in which the general problem of studying social effects of nuclear attack has been misleadingly defined in the past, and considers the need for a society-wide analytic perspective in projecting social effects. The special theme throughout this chapter is the need for getting beyond trying merely to predict many tiny items of individual behavioral response to attack; the important task is to show how more general levels of behavioral ordering --- particularly social institutional and social organizational processes --- set the dimensions for social effects. While this chapter sets the framework for later specific analyses, it advances few findings which are meant to be applied directly and immediately to planning and operating problems in civil defense.

Part II consists of five "criterion essays" written by authorities in specific areas of social institutional analysis. These essays are called "criterion essays"

because they are a group of complex judgments about what are the crucial domains of possible post-attack events with which planners must contend if they are to preserve the valued characteristics of American society. These essays outline within the limits of available knowledge and informed speculation the critical classes, ranges, and limits of behavioral events governed by specific social institutions. These critical classes, ranges, and limits are the criteria within which and against which vulnerability and recovery of society must be described. Chapters II through V in Part II deal with specific institutional domains and either possible or probable patterns of post-attack behavior. Throughout these chapters, the reader will note many specific conclusions and recommendations about policies and systems for governing specific categories of attack effects. Chapter VI in Part II is primarily methodological in emphasis. It is a return to specific issues raised by the attempt in Chapter II to establish the general "social dimensions of nuclear attack". While of much interest for further studies of the problems in making inferences about possible social effects of attack, it is not oriented toward providing officials with many concrete policy and systems recommendations.

Part III, the final section of the book, consists of one relatively short chapter which applies the findings and tools of the book to some problems of civil defense and civil defense-related planning. After providing a general review of basic findings in propositional form, the author of Chapter VII traces how important categories of social determinants emerge and recede as determinants of events and problems after attack. These categories of determinants are the four principal domains of behavioral ordering in society: the individual system, the social system, the ecological system, and the cultural system. These domains have variable and differential salience as determinants of social effects and social decision points about countermeasure systems and policies, as time lengthens after attack. To show these patterns of differences, two devices are employed. First, a metaphor to describe the sequential appearance and ordering of determinants is introduced. This is the "metaphor of the stepped progression" Then, the analyst considers the possible social effects and social constraints on events resulting from the principal civil defense system to date --- the shelter system.

In studying the sequences and orderings of social effects activated by a fallout shelter system, it appears possible to determine the general problems, policy-requirements, and systems requirements which must be faced if the general social inventory available for recovery is to be maximized. The chapter stops short of providing explicit guidelines for defining and managing the unstable social equilibrium system created by nuclear attack. These must come later, after further study of the ways in which general determinants of social action contribute to the social effects of nuclear attack. On the other hand, a number of specific needs and systems requirements are highlighted in Chapter VII. These needs and requirements include the development of societal criteria for evaluating civil defense policy, the use of the voluntary sector of society for managing acute grief as well as the general shock of attack, policies and organizations for managing emergent concrete social systems after attack, a prototypical social welfare policy of placing orphans with kin, labor force and manpower policies, and decisions about post-attack population policies regarding population size, composition, and rate of growth. These and other requirements derive from the ways in which specific and interacting sets of determinants influence the occurrence of social effects and responses after nuclear attack. Implied within these specific requirements is a radically new way of looking at civil defense --- a way which implies a society-wide framework for managing society-wide responsibilities.

Continuities in the Analytic Themes of This Book

The present state of knowledge in the social sciences dictates that this be a volume on the vulnerabilities and not on the vulnerability of social structure. From varied, discrete domains of substantive interest and partial theory, the contributors to this volume have attempted to construct inferences about particular kinds of social effects that might follow nuclear attack, and about the possible relations among individual patterns of effects within larger patterns of social effects and institutional processes. These inferences suggest how the social system may be vulnerable in particular ways to nuclear attack. At present, however, these inferences cannot be combined into a tested general theoretical formulation of how the total society is vulnerable as a total society or social system.

Nevertheless, the continuing applied as well as theoretical goal of the book is to move, wherever possible, beyond examining visible but isolated social effects, and toward seeing these effects within the larger patterns and processes of society which civil defense planners must attempt to address. These larger patterns and processes exist at a level of analysis beyond individual unit acts of behavior, even though they must be studied in both normal and crisis times through these unit acts. In some cases, the contributors to this book take social structural and institutional dimensions and variables as levels of discourse upon which to begin immediate analysis of nuclear attack effects. For them and other social scientists, these dimensions and variables can be taken as existing and valid, without further discussion. Under the additional uncertainties imposed by analyzing the social effects of nuclear attack, however, it is useful to say just how inferences can be drawn from effects at the level of individual human actors to effects at the level of complex institutional and social structural processes. Because the ambiguities in projecting possible attack effects seem to reinforce basic problems of nominalism in the social sciences, some writers in this volume are explicitly concerned with stating the kinds of rules, procedures, models, and metaphors which seem best suited to making existing social evidence tractable to the task of studying nuclear attack.[1] In doing so, they are also writing about the necessary conditions for constructing concepts, generalizations, models, and theories in the social sciences.

The Opening Arguments: The Analytic Task as Portrayed in Chapter I. It is in Chapter I, "Social Vulnerability and Recovery as Analytic Problems", that the special problems of making inferences about the social effects of attack receive

[1] For a definition of a "nominalistic position" toward inquiry undertaken in this volume, see Neil Smelser's statement below, p. 596: "In order to pose a scientific question the investigator must operate within a conceptual framework by which the major dependent variables are to be described, classified, and analyzed. Without such a framework he cannot identify ranges of empirical variation that are scientifically problematical. With respect to this characterization of dependent variables I hold an explicitly nominalistic position: that the dependent variables are not in any natural way 'given' in social reality, but are the product of a selective identification of aspects of the empirical world of social phenomena by the investigator for purposes of scientific analysis".

their first detailed statement. In the first part of the chapter, the editor discusses the kinds of conceptual and analytic problems inherent in the general attempt to project the social effects of nuclear attack. In the second part, he turns to the specific kinds of knowledge which may be attainable about the post-attack social world, once attempts are made to deal with these conceptual and analytic problems.

The analytic work of the chapter and the book opens with a reappraisal of the evidence which exists on the question of whether "panic" would follow a massive social disaster of the kind represented by nuclear attack. Panic turns out to be highly unlikely, except under conditions which appear to be tractable to advance planning. But even if panic turns out to be largely a fear myth, is this really a significant finding for post-attack planners? The answer depends on events beyond the level of small unit acts of individual behavior in society. To know whether panic would occur, and to know whether it is of high priority or low priority among the many social effects of attack that might occur and which might receive administrative attention, it is necessary to extend the analytic question beyond attempts to predict and control individual or small group behavior. The social effects of attack must be understood as resulting from other levels of behavioral determinants.

The principal theme of not only the chapter but also the book thus emerges: to know the ways in which individual items of behavioral response to attack are the resultants of complex social processes of behavioral ordering which exist beyond the individual and his immediate groups. These complex social processes of behavioral ordering occur as a result of the functioning of a number of systems beyond the level of individual behavior. To know the varieties of social effects which might follow attack, whether these effects be individual behaviors or social processes of much larger scope, it is necessary to know how these systems determine behavior. It is particularly necessary to know how these systems are manifested in the institutional and organizational processes of society.

This new focus opens up its own characteristic problems. How can knowledge about levels of determinants of social effects beyond the individual be developed? How can it be applied to attempts to show the interrelations among possible kinds of social effects following nuclear attack, so that analysts and planners can

get a clearer understanding of what effects are likely to be most important? After a review of some available conceptual techniques for answering these questions, it is concluded that to resolve at least tentatively the problems of hierarchical ordering, closure, and specification, a rough model of the general social system should be employed. This model should emphasize the ranges and limits of phenomena; at present, it is impossible to construct a model which strictly determines individual behaviors or social processes. One way of viewing the social system model which is used is to consider it as being at least partially a metaphor for society.

In the second main part of the chapter, the properties of this metaphor-model of the social system are used to outline the dimensions of society within which social responses to nuclear attack would be determined. While these actual responses can be viewed only as visible behaviors or visible characteristics of group and aggregates, they can be shown to be the result of a process of hierarchical specification. This process begins and ends in the situation of action. The key to understanding the way in which different kinds of social effects and responses from nuclear attack would be manifested at different times after attack and on different levels of the processes which order social behavior is to be found in the varying degrees to which effects and responses are "dependent" on the situation of action. Initial, visible social effects always occur in a specific, concrete situation of action. But social effects represented in damage to individual and group patterns of behavior are translated to other levels of the total set of systems which determine social action. These other levels to which effects are translated include especially the level of social institutions, but they also include very general, major systems which maintain the fundamental characteristics of society. These general systems whose maintenance functions may ultimately be affected, are the ecological system and the cultural system.

Implied in this total metaphor-model for viewing how social effects of nuclear attack may be translated back and forth among levels of social ordering in society is a new view of the basic framework within which civil defense policies and systems should be evaluated. To define and understand the social effects of nuclear attack, it is necessary to take a society-wide perspective and to develop "societal criteria". The whole set of processes and states of the social system becomes the

final criterion for determining both the social effects of nuclear attack and means for dealing with attack effects.

The need to take a society-wide perspective in any meaningful discussion of the social effects of nuclear attack makes it practically as well as analytically useful in this book to use massive attack assumptions to guide the contributors. It is freely conceded that a potential enemy might not use a massive nuclear attack on American society, just as it is freely conceded that some specific projections of attack effects in this volume may be "sensitive" to attack assumptions. The contention here, however, is that any fully meaningful view of social effects and social policies designed to deal with them must be framed within a society-wide analytic perspective. Using massive attack assumptions is a convenient device for highlighting and expressing this need.

Development of "societal criteria" and society-wide perspectives for civil defense planning has been impeded by the organization of the official environment in which civil defense research must be done. The chapter concludes with an outline of ways in which the general characteristics of bureaucracies and the particular division of responsibilities between the Office of Emergency Planning and the Office of Civil Defense create analytic difficulties for the researcher, planner, systems designer, operating official, and policy-maker who are concerned with developing meaningful civil defense systems. From the viewpoint of the total societal mission implied by civil defense and emergency operations functions, OEP is a "head without a body", while OCD is a "body without a head". The present official environment for planning is organizationally fragmented and limited by the kinds of missions that have been deemed feasible. The basic analytic consequence of this set of organizational constraints is that planners are diverted from stating and using the analytic tools necessary for understanding and managing attack effects which occur within and throughout a total social system --- and which can be meaningfully studied only in terms of the total social system.

Five Criterion Essays: Chapters II through VI. In the second Part of the book, the emphasis of the contributors is not upon constructing a general orientation toward those processes which specify behavior within the total social system

of society, and which therefore set the determinants for social effects of nuclear attack. In constrast, the overriding concern in Part II is to review a number of specific, critical areas of knowledge, where groups of findings and partial models or theories enable the analysts to construct sets of propositions about the events that may be expected within particular institutional sectors of society after attack. Consequently, the propositions developed in the five "criterion essays" do not necessarily reflect a common theoretical perspective, nor do they necessarily exhaust all the issues which a particular analyst might feel to be within his competence. Rather, the findings developed in these five essays often represent the analysts' best judgments about what will be important.[2] As a group, these findings form complementary ingredients for a larger attempt to develop a total view of the way in which social effects are determined after attack. But there is nothing in these findings or in the theoretical perspectives which the analysts employed in their essays to dictate the structure of the total view which might be developed to describe and explain the functioning of social determinants after attack.

For convenience in giving the reader an overview, the editor has provided a separate, introductory statement for each chapter in Part II. In these introductions, the editor advances some partially speculative notions about how the content of each chapter would fit into a larger, organizing view of processes within the total social system. The reader should bear in mind, however, that the contributors to Part II usually had more precisely focused conceptions of their task. Thus, in writing on "The Social Dimensions of Nuclear Attack" in Chapter II, Neil Smelser is particularly concerned to establish groups of propositions which will project plausible, possible, or probable behavior of individuals and collectivities after attack. As he moves toward the longer term responses of complex organizations, institutions, and cultural values, he freely concedes that his propositions become much less certain. Similarly, in writing on "Demographic Aspects of Vulnerability and Recuperation from Nuclear Attack" in Chapter III, David Heer is dealing with phenomena which may be conceptually placed on the level of "ecological system

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[2] On the groundrules which guided the writing of these essays and on their place within a total analysis of society under nuclear attack, see "Appendix to Chapter I, On Reading the Five Essays in Part II", below, pp. 185-203.

functioning" in society. From his point of view, however, Heer is attempting to deal with the population as a target of attack; his methods emphasize currently available population data and demographic techniques.

In Chapter IV, Sidney Winter's task is complex enough without adding overarching theoretical concerns and demands to it. While organizing economic institutions is probably the most crucial strictly "adaptive" problem confronting the social system after attack, Winter's analysis is manageable only if a number of social system considerations are at least temporarily explicitly excluded. In themselves, "the assessment of the impact of nuclear war on the economic activity of the nation, the determination of conditions under which a meaningful degree of economic recovery might occur, and the development of policies which would enhance the prospects for such recovery" are formidable tasks when deliberately limited only to strictly economic dimensions.[3] Given the state of political science, Howard Swearer's approach to the political-administrative dimensions of nuclear attack in Chapter V is dominated by the attempt to develop tools for comparing the responses of administrative systems as administrative systems. While central to the essay, many of the more provocative cultural and stylistic differences between the American and Soviet systems cannot be thoroughly explored in an essay of the scope permitted in this volume.

It is not surprising, therefore, that the last chapter in Part II, Smelser's "Methodological Issues in the Social Analysis of Nuclear Attack and Recovery", is a detailed return to the many unresolved issues that were confronted in attempts to draw valid inferences about particular individual, collective, organizational, and cultural responses to nuclear attack. Only at the very end does Smelser venture toward the creation of formal models of attack and recovery --- and toward considering the problems of general social system theory raised by such a venture.[4]

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[3] The phraseology of these central purposes of Winter's essay is his, below, p. 329.

[4] See below, pp. 650-655. Since he completed the present Chapter VI, Smelser has dealt in detail with many of these general issues of theory. See Neil J. Smelser, Theories of Social Change and the Analysis of Nuclear Attack and Recovery (McLean, Va.: Human Sciences Research, Inc., HSR-RR-67/1-Me, January, 1967), 151 pp. plus Foreword.

Applications to Planning: The Tentative Synthesis in Chapter VII. Since there were great analytic demands in exploring particular domains of attack effects, and since all contributors to this volume recognized that a general, rigorous statement of the full determinants of post-attack social effects would be premature, it was clear at the outset that any concluding integration or synthesis of the book's findings would necessarily be primarily heuristic. On the other hand, the needs of planners and operating officials exist in the present. These needs must be met by more than the intellectual equivalents of promissory notes.

For this reason, the editor turned to the general orientation toward society advanced earlier as one of several types of organizing principle for integrating the findings of the book. In Chapter VII, this orientation is used to provide working metaphors and models to aid the planning and operating official in understanding possible patterns of critical interrelations among the social effects of nuclear attack.

Chapter VII provides a specific outline of the ways in which specific kinds of individual behavioral forms and institutional processes which are critical to managing the social effects of nuclear disaster may vary according to time after attack and conditions which have intervened between attack time and the time under immediate analysis. The problem is to explore the ways in which behavioral and institutional domains have variable salience for analysis and planning after attack. Associated with each salient domain will be a number of salient decision points. A decision point which is salient at one time may be less salient at another time following attack, sometimes regardless of whether decisions have been made at other critical points.

Viewing the findings of this volume in this general manner provides a basis for restating the central issue confronting planners of systems to reduce societal vulnerability and enhance social recovery. This issue is the problem of maximizing and managing the post-attack "social inventory", in order to maximize options for institutionally governed reconstruction within a moving but unstable social equilibrium system.

Preliminary to this analysis of the variable salience of particular domains of determinants, however, it is necessary to review some general principles for

analyzing the different domains as they may exist after nuclear attack. Among the most important of these principles are:

1. Avoiding the radical indeterminism and radical rejection of coherent analysis inherent in saying that there will be absolutely no connection between pre-attack and post-attack social life (A. 1);[5]

2. Focusing on setting ranges and limits of social effects, as the primary analytic task (A. 2);

3. Recognizing the situational dependence of first effects: The first effects of attack are expressed in the "situation of action", which constitutes the concrete arena of human behavior; consequently, these effects are translated into behavioral and social effects in the form of effects on individual and social systems, which are systems of behavioral ordering that are relatively "dependent" on the situation of action. (A. 3)

4. Emphasizing the sequential ordering of attack effects: Because social effects will be translated to different times and different levels of society, they will occur in sequential orders and time-dependent series, through a progression of determinants which vary in salience and consequence from one time to another. The organizing metaphor for depicting and analyzing this sequential ordering is the paradigm for a stepped progression (see Figure VII-1a/1b, p. 681, and Figure VII-2, p. 703). (A. 4)

5. Accepting the relativity of concepts of "vulnerability" and "recovery" and of definitions of post-attack temporal phases (A. 4. 1 and A. 4. 2);

6. Avoiding the temptation toward analytically overdetermining behavior or, in practical planning and operations, toward assuming that decision and control on one institutional or social structural level can be fully translated to general control and particular behavioral specification on another, more immediate level (A. 5);

7. Understanding the ways in which "recovery" combines scientific-analytic and policy tasks: Definitions of "recovery" may assume the restoration of previous states of society or the creation of new states based on the remains of previous states. Describing pre-attack and post-attack social states is a mixed analytic-empirical task. While the post-attack society and its domains of possible

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[5]The serial numbers in parentheses after each principle in this list are those of the original statements in Chapter VII from which the present summary statement has been abstracted.

behavior and behavioral ordering constitute the basic inventory for social reconstruction and recovery, the decision to guide reconstruction in desired directions is a policy decision, not directly derivable from the logic used to describe existing realities. (A. 6)

8. Adapting to the lack of a unified social model for planning purposes (A. 7 and A. 7. 1);

9. Further developing what is both principle and hypothesis: (principle) that while society under stress of massive disaster can be seen as a set of institutional domains whose interrelations are only imperfectly understood, nevertheless (hypothesis) each domain has a distinctive range of disaster-induced critical decision points, within which decisions affecting the longer term "viability" of that institutional nexus must be made (A. 8);

10. Using some useful working hypotheses in developing the principle and hypothesis combined in proposition 9 immediately above: One is that at different times following attack, events in one institutional domain or social structural sector may be more critical to survival and adaptation than events occurring in other domains of social phenomena. Another is that there are identifiable critical patterns of social structure which are preconditions to institutional mobilization and viability, within a given domain. A final set is that the greater the structural complexity and interdependence of a society, the more quickly will social damage be translated throughout the system, but more resources for recovery will exist, because of redundant capacities --- once these capacities can be organized. (A. 8. 1 - A. 8. 3)

11. Using the multiple functions of information about post-attack society: A given analysis, finding, or prediction about the post-attack situation may have more than one function in planning for and managing emergency. Such an increment to knowledge may be most vivid as a breaker of myths, but it may be important to evaluate its significance as an item of additive knowledge --- unless, of course, myth-breaking is crucial to mobilization for viability and recovery. (A. 10)

Within this general framework of findings, the shelter concept can be examined as a concept which will affect a number of post-attack behavioral and institutional processes. The existence of a shelter system, as a system for ordering behavior, creates a number of ranges of post-attack behavioral possibilities. By studying these domains and their ranges, it may be possible to understand more clearly not only the general consequences of any shelter system, but also the way in which positing a shelter system provides the analyst with coherent clues about

the general properties of the post-attack social world. From these clues may come requirements for an unfolding chain of systems designed to manage post-attack social life more relevantly and more effectively. But it should be continually noted that the purpose here is neither to evaluate particular shelter systems nor to sketch a complete post-attack social world. Instead, the purpose is to show how a particular countermeasure system creates the conditions for a series of resulting effects which are ordered by the basic levels of behavioral determinants in society. The resulting ordered series of social effects would form part of the post-attack social inventory which will be available for recovery efforts. When the shelter concept is put in the form of an operating system, it will impose a characteristic sequence upon the systematic processes which order post-attack behavior and from which derive behaviors which will be of critical significance to planners. Other system concepts might impose somewhat different sequences and orderings of effects.

As a shelter system functions to shield one sub-population and to define a set of social foci for the other sub-population less immediately affected by weapons, there appears to be a characteristic sequence of critical determinants of post-attack social responses. This sequence branches out in complexity over time.

At the beginning of post-attack time (in the Warning and Impact Period), the individual system --- as a large aggregate of individual systems --- is the most critical set of determinants of the social effects that follow. During the actual Shelter Period, the social system appears as at least co-equal to the individual system in determining the later characteristics of post-attack life. Upon Emergence into the Reorganization Period of the post-shelter phase of post-attack life, the combination of individual system and social system determinants which acted earlier now raises events in the ecological system of society to the status of critical determinants. Finally, as longer term recovery begins, events in the individual, social, and ecological systems have interacted to raise events and effects at the level of the cultural system of society to their maximum importance in determining the kind of society that will exist in the future. Thus, within the time frame imposed by the shelter concept, the pattern of sequential ordering among the determinants of

post-attack behavior and social processes moves from individual to social, individual-social to ecological, and individual-social-ecological to cultural. At any given time within this stepped progression, there are secondary patterns of influence among systems of determinants, beyond the primary process in which new systems rise to salience.

This description of the sequential ordering and differential salience of post-attack social determinants should be seen primarily as an analytic model for organizing many specific events which have heretofore been difficult to place in a common frame. Within this stepped progression, relations among a number of particular findings can be explored.

> 1. The individual system as a set or aggregate of sets of determinants emerges first, because the primary purpose of a shelter system is to protect individuals, and it will be the behavior of many individuals in many concrete situations of action which determines whether future capacities for behavior and behavioral ordering in other domains will be brought into shelter environments. (B. 1)[6]
>
> 1.1. Under certain, controllable conditions, individuals may panic. Panic would be one of the first collective responses that could occur under existing conditions of warning and shelter-taking. (B. 1. 1)
>
> 1.2. The characteristics of the post-attack population --- an issue which rises to critical salience only after the shelter period --- are already being determined in part by the capacities of individuals to attend to warning to move to shelter. Individuals in shelters constitute, in the aggregate, a population with specific categories of characteristics as a population. These characteristics do not become operative as constraints upon survival or recovery until later in post-attack time, unless there are specific deficiencies of critical skills required to organize and maintain shelters, among those taking shelter. In the event of a massive attack directed against the whole society, the aggregate characteristics of the population within shelters will probably be indicators of the fundamental demographic constraints upon recovery in the ecological system. (B. 1. 2)

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[6] As in the previous list given here, the serial numbers after each proposition in this list are those of the original propositions in Chapter VII from which this present summary proposition has been abstracted.

1.3. To preserve the necessary aggregate of individual system determinants of post-attack social response, the specific requirements of effective movement to shelter must be known and met. (B.1.3) Later during the shelter period, the surviving characteristics of individuals must be inventoried, as a preliminary to determining necessary population policies upon Emergence.

2. The social system as a set of determinants rises to critical salience during the time of actual sheltering after attack, both for the sheltered and the non-sheltered, since capacities for social organization become critical to meeting the requirements for coping with physical threats, allocating scarce resources, and controlling a mass of individuals under stress. (B.2)

2.1. Definite functional requirements of the shelter as a social system can be identified; these social system requirements must be met, if individuals are to have their needs met while in shelter and are to be prepared for successful emergence into a post-attack world. (B.2.1)

2.2. One of the first requirements in re-establishing social order among a non-sheltered population is to control convergence phenomena. (B.2.2)

2.3. But within the emergent social systems and social system requirements of the actual Shelter Period, individuals will continue to have specific sets of needs as individuals. These will include especially needs to cope with death, feelings of grief, and with visible disorganization of behavior patterns governed by valued institutions. Thus, determinants on the level of the individual as a system will still govern critical social effects of attack, and planning must be directed to meet individual needs as individual needs. (B.3.1 and B.3.1.a)

2.4. As the Shelter Period changes into the Reorganization Period, the ecological system becomes critically salient, but the social system remains salient to planning on two levels. First, the social system of the Shelter Period must be transformed into more complex, less constricted patterns of living during Reorganization. Second, critical processes which must occur on the level of the ecological system during Reorganization must depend upon social system determinants of patterns of resource allocation and division of labor. (B.4)

2.4.a. Among the specific patterns of demand and conflict that will probably be created by the transition from Shelter to Reorganization are the demands that executives replace heroes,

that local communities defer claims based on special feelings of deprivation, that individuals continue to accept burdensome personal obligations after the most vivid crisis mood has dwindled, that pre-attack systems of reward and status be re-instituted in the face of radical differences in the effects of attack on individuals, and that government allow latitude for dissent amid conditions that may require attempts at social and personal control of lives which go far beyond previous experience. (B.4.1) For each of these potential sources of conflict, there is a demand for social policy and social control.

2.4.b. The attainment of economic viability (see Chapter IV) will be one of the most urgent requirements levied upon the structural-institutional and policy resources of the social system. (B.4.2 and B.4.2.a)

3. The requirements of the ecological system of society become critical during the Reorganization Period. Upon Emergence into the Reorganization Period, the fundamental challenge to both survivors and their social system is to create the conditions for maintaining themselves as a society. Immediate subsistence is less critical, though still pressing. Re-establishing a self-maintaining society will require a number of specific, critical tasks of adaptation and maintenance; the critical level of behavioral ordering which determines the ranges and requirements of these tasks will be the ecological system, a system whose primary function is maintenance and a system which is relatively independent of immediate situation. In particular, the human population of the society must be inventoried, stabilized in its physical environment, and, if necessary, managed as a population. Using social system resources surviving from the Shelter Period for creating and attaining ecological stability becomes the dominant functional requirement in building a basis for a self-maintaining population in the Reorganization Period. (B.5)

3.1. The aggregate human resources for recovery are the population of the society. Not only must the population have the distribution of traits required for the jobs of an industrial society, but the development and use of these traits must be sustained by particular policies based on the known characteristics of the population. One of the striking possible traits of the American population after even low level attacks appears to be a marked increase in the number of orphans. To support this shifted dependency burden, some system of orphan management would be required. Within the American social setting, placement of orphans with kin appears as a possible, acceptable solution to the burden created by a large increase in orphans. Such a plan of orphan assignment is an illustration of the kinds of social welfare policies and systems which may be dictated by the post-attack population and its management requirements. (B.5.1 and B.5.1.a)

3.2. In general, success in solving a number of organizational problems at the level of the social system will determine the capacity of the ecological system to re-establish a self-replicating population of human individuals. (B.5.2, B.5.3, and B.6)

4. While elements of the cultural system will affect behavior at all times following attack, especially in the form of the effects of shared values on responses to disaster, the cultural system as a unified system of values, symbols, meanings, and behavioral prescriptions does not become critically salient as a system to planning until the Recovery Period gradually begins. Then, the effects of the total set of responses made by different levels of the social system to attack can be discovered and assessed, as they have worked to redefine the cultural system. This will occur as political dialogue is restored; possibly, this process may begin in value conflicts over the degree of government involvement and institutional mobilization in post-attack society. In any event, a "regressive" cultural state is unlikely. (B.7 and B.7.1 - B.7.3)

As a total system, post-attack society can probably be managed only through particular domains of determinants and particular ranges of critical decision and control. Thus, there are inherent indeterminacies in the relations among various programs, policies, and countermeasure systems for managing the sequences of possible post-attack social effects. At any point in post-attack time, the administrator may confront a variety of possible relations among systems and effects and a variety of possible allocations of social resources. In sum, he will have varied options and ambiguous sets of total criteria for choice.

Some Implications for Needed Policy and Action

If civil defense planners and administrators are to respond meaningfully to the kinds of principles and propositions which have just been listed, then they must be able to have these findings reformulated in terms of policy and action requirements. They must have these reformulations in spite of the careful qualifications and limitations which have been attached to these findings, when they are expressed in the rhetoric of social science. They must have these reformulations even while continuing to recognize that the emphases of this book have been (1) upon trying to show how fundamental scientific questions in projecting the social effects of nuclear attack can be approached, and (2) upon demonstrating how the necessary

tools and findings that come out of the analysis point to broad categories of requirements and constraints on any generally comprehensive social countermeasure system that might be proposed.

Granted all the problems in making inferences about the social effects of nuclear attack --- what should civil defense planners and administrators do now, to be guided by the findings in this book? Looking beyond the kinds of illustrative, specific systems proposed throughout the book, and especially in Chapter VII, there appear to be a number of implications for policy and action in both the methods and findings developed here. If these implications were to be stated in the form of requirements for policy and action, the following seven statements would probably be the most important "findings" from this book:

1. The term "social effects" has a necessarily broad meaning, a meaning which underlies a broadened and comprehensive civil defense mission. The social effects and dimensions of nuclear attack must be understood to include effects which have often, by tradition or convenience, been considered as isolated classes. Among these effects are "economic" effects, "political" effects, "cultural" effects, "psychological" effects, and "demographic" effects.

2. Civil defense systems must be evaluated in terms of their social and societal effects. The most important analytic and planning requirement is for the development of new and comprehensive social criteria for establishing the ranges and meanings of attack effects and for projecting and evaluating the performance of any specific, proposed civil defense social countermeasure system. Such a system of social criteria would require using a society-wide frame of reference, and its uses would reach far beyond the design of civil defense and other national security systems and policies.

In the case of the shelter concept, for example, it is no longer meaningful to evaluate the "cost-effectiveness" of alternative shelter postures in terms of "number of additional lives saved" or "number of additional lives saved per increment of funds" (see Chapter I, pp. 154-161, esp. pp. 160-161).

3. New techniques for assessing the "social cost-effectiveness" of civil defense systems are therefore needed. The development of these new criteria and techniques implies the need for developing new, non-economic "social cost-effectiveness" methods for evaluating civil defense and other national security systems.

4. A national social inventory for social damage assessment is an indispensable working tool. For both pre-attack planning and building and post-attack emergency operations, the development and application of social criteria and society-wide frameworks requires the capacity to inventory the salient characteristics of the surviving society and population in their various attributes. Especially important are data on individual attributes, relations among individuals, group characteristics, and cultural characteristics. This inventory could begin as a supplement to existing systems of damage assessment. It could develop into a comprehensive national inventory of social traits and indicators. The development of such a social inventorying capacity is one of the most critical tasks confronting any agency whose planning and operating responsibilities reach ultimately through the whole social system.

5. New "social management" policies and systems must be developed. As the criteria for defining specific systems and their effects come to include effects occurring within and/or affecting the total social system, there will be an urgent need to understand the organizational requirements imposed by new "social management" responsibilities. "Civil defense" will expand beyond short term emergency operation of physical countermeasure systems; as a set of missions and objectives, civil defense functions will be inextricably bound up with providing and managing the social resources needed for complex processes of societal recovery. In providing these social resources, many specific social management policies and systems will be needed. These range from immediate procedures for using groups and social systems that emerge in the short run, through policies for meeting special social needs and claims (for example, a possible national orphan assignment plan; a system for validating and equalizing economic assets), up to large scale population policies.

6. These social management policies will create specific organizational problems, and there will be serious questions about their feasibility. A critical lesson from studies and projections of emergency operations under massive disaster is the danger of attempting too much administrative control of specific processes of adaptation and recovery. Yet, the broad reach of especially massive nuclear attack creates the need for policies and systems of society-wide scope, for coping with complex, interacting sequences of social effects. Major attention must be given to the dilemmas of creating organizations which must respond to large scale social effects and problems, but which, when responding, may create their own distinctive problems. Solving these dilemmas will be further complicated by the American tradition of socio-political pluralism.

7. Experience gained from working with "societal criteria" and from developing new kinds of countermeasure systems to deal with the social effects of nuclear attack may be applied to a radically new conception of civil defense in a society not under external attack. As society becomes structurally more complex and interdependent, it may be vulnerable to disasters which occur because of failures in the complex networks which comprise the social system. Such "failures" range from massive physical failures --- as in the Northeast Power Failure of November, 1965 --- to the institutional weaknesses which lead to racial insurrection or general political instability. It is not inconceivable that in the future, the primary emergency operations functions of civil defense agencies will be in controlling and managing such "systemic" failures. The necessity to think, plan, build, and operate in the society-wide analytic framework imposed by considering the social effects of nuclear war may create the analytic and practical basis for understanding this potential new basic civil defense mission. The similarities between responding to nuclear attack and responding to new categories of "systemic disaster" should receive intensive study.

With these seven statements, the work of the social scientist ends, and the work of the policy-maker, systems-designer, and operating official begins. It is the job of these individuals to decide whether policy and action will, in fact, be guided by these statements, and whether, in fact, these statements will be reflected in the goals of government.

S. D. Vestermark, Jr.

McLean, Virginia
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S. D. Vestermark, Jr.

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TABLE OF CONTENTS

Part I: The Analytic Task

	Page
FOREWORD	iii
ACKNOWLEDGMENTS	xxv
About the Contributors to Part II	xxviii
CHAPTER I: SOCIAL VULNERABILITY AND RECOVERY AS ANALYTIC PROBLEMS, S. D. Vestermark, Jr.	5
I. Some Necessary Conceptual Ambiguities	5
Interactions Among Basic Problems	5
"Panic", as an Illustrative Case	6
Some Available Conceptual Techniques	25
Simulation, and the Problem of Validity	37
Propositional Inventories, and the Problems of Hierarchical Ordering and Closure	45
(1) Individual aggregate measures versus a community model	54
(2) The generality of the hierarchical model	56
(3) Propositions and the problems of hierarchical ordering and closure	56
A Compromise: Setting Ranges and Limits, and the Problems of Hierarchical Ordering, Closure, and Specification	59
Metaphor and Myth in the Study of Social Stress	65
Uncertainties from Metaphor	65
Utilities of Metaphor	76
II. Knowledge about Possible Post-Attack Worlds	82
Institutional Dimensions of the Social System	82
Society, Social System, and Social Structure as Entities	82
Institutions and the Hierarchical Ordering of Behavioral Determinants	90

Page

Institutional-Behavioral Systems of Society, and Situational Dependence of Behavior as a Clue to Their Pre-Attack and Post-Attack Functions 103

Institutional Dimensions as Ranges and Limits to Social Vulnerability and Recovery 123

The Format of Post-Attack Knowledge 138

Concepts, Events, and Discriminable Behavior 138

Projections, Propositions, and Assertions with Varying Degrees of Certainty 139

Relevant Conditions as Constraints on What is Known 141

Attack Assumptions as Sources of Uncertainties: The Assumption of Massive Attack 147

Massive Attack as an Assumption in Social Science Analysis 150

Massive Attack as an Assumption in National Security Analysis 153

Organizational Constraints on the Definition and Use of Post-Attack Knowledge 154

The Official Environment 154

Organizational Characteristics Which Create Organizational Constraints 162

The Social System as Criterion 177

In National Security Analysis 177

In Social Science Analysis 180

APPENDIX TO CHAPTER I: ON READING THE FIVE ESSAYS IN PART II 185

The Evolution of the Five Essays 187

Assumptions Guiding the Essays 192

Institutions and the Phases of Post-Attack Time 195

Themes and Relations Among the Five Essays 202

Part II: Five Criterion Essays

	Page
INTRODUCTION TO CHAPTER II	207
CHAPTER II: THE SOCIAL DIMENSIONS OF NUCLEAR ATTACK Neil J. Smelser, University of California, Berkeley	211
Goal of the Analysis: Conditional Predictions About Social Behavior in Post-Attack Society	222
Assumptions Regarding the Dimensions of the Nuclear Attack	223
Warning and Attack Phase	225
The Shelter Phase	232
The Emergence Phase	244
The Adjustment Phase	251
The Recovery Phase	256
INTRODUCTION TO CHAPTER III	261
Population Size	261
Population Composition	262
Rate of Population Growth	263
CHAPTER III: DEMOGRAPHIC ASPECTS OF VULNERABILITY AND RECUPERATION FROM NUCLEAR ATTACK David M. Heer, Harvard University	265
I. Population Size	265
Relations Between Demographic and Economic Effects: Some Issues	269
Population Size and Scientific Output	271
Population Size and the External Position of the United States	272
Population Size: A Preliminary Summary	281
II. Population Composition	282
Distributions of Age and Sex Characteristics	284
Marital and Family Characteristics	295
Levels of Education, Training, and Occupational Skill	297

Page

Incidence of Sick and Disabled..... 310

Recovery of Appropriate Composition: Summary..... 310

III. The Rate of Population Growth..... 311

Birth Rate..... 311

Death Rate..... 313

Problems in the Recovery of Appropriate Birth and Death Rates..... 316

IV. Summary..... 317

INTRODUCTION TO CHAPTER IV..... 323

CHAPTER IV: SOCIETAL RECOVERY AFTER NUCLEAR WAR: THE ECONOMIC DIMENSIONS
Sidney G. Winter, Jr., University of California, Berkeley..... 327

I. Introduction..... 327

National Policy and Nuclear War..... 327

Questions of Methodology..... 330

Questions of Value and Ideology in an Economic Analysis..... 333

An Overview of This Essay..... 341

II. The Economic Problems of Post-Attack Society..... 342

Distinctive Features of the Post-Attack Economy..... 342

The Threat to Population Survival: Providing Necessities of Life to Survivors..... 342

Dominance of National over Private Objectives..... 343

Crippling of Basic Economic Institutions..... 344

Unsettling of Expectations about the Future..... 345

Radical Alteration of Pattern of Relative Scarcities..... 346

Abrupt Decline in Consumption Standards..... 346

Summary: "Post-Attack Economics"..... 346

Page

Organizational versus Technological Considerations: A First Partitioning of the Problem 347

The Methods of Welfare Economics: Ideal Markets 351

Some Relevant Assumptions and Concepts from Welfare Economics 352

Types of Market Failure and Applications to the Post-Attack Situation 354

Three Phases of Recovery: The Time Dimension 359

III. The Survival Phase 362

The Analysis of a Range of Possible Situations 363

Attack Variables and Survival 364

Attack Weight 365

Weapon Yield 366

Fission Fraction 366

Height of Burst 366

Target System 367

Weather 368

Time of Day 369

Season 369

Shelter and Warning 369

Circumstances of War Outbreak 370

The Balance between Population and Resources 370

The Resource Base of Survival Activities 371

Food 371

Heating Fuel 373

Consumer Durables and Housing 374

Services 376

Some Organizational Aspects of Survival Phase Activities 379

Control over Stocks of Essentials 379

Procedures for Equitable Distribution of Essential Stocks 382

Operation of Essential Services 385

Page

IV. The Reorganization Phase and the Achievement of Viability 387

Technological Aspects of Achieving Viability: Qualitative Discussion 389

An Illustrative Model 390

Economic Reality and Limitations of the Model 394

Technological Aspects of Achieving Viability: A Quantitative Survey 396

The Gap between Present Consumption Levels and Subsistence Needs 397

Food Stocks 397

Industrial Capacity 398

Agriculture and Supporting Industries 402

Attack Levels and the Achievement of Viability 405

Per Capita Consumption and the Problem of Defining "Subsistence Levels" 408

Organizational Aspects of Achieving Viability: The Relevance of Historical Experience 412

Lessons from American Economic Controls in World War II 413

The Contrast between World War II and the Aftermath of Nuclear War 417

Designing the Tools of Economic Control: Issues 419

Private Interests as an Obstacle to Effective Control 419

Desirability of Voluntary Compliance 420

Administrative Resources in Relation to Control Functions 422

Compatibility between Levels of Control and Institutional Means for Resolving Residual Problems 424

Two Alternatives of Economic Organization: Relative Centralization and Compulsion Versus Relative Decentralization and Private Incentives 425

Page

Restoration of a Market Economy: Some Suggestions 427

Individual Property Rights and Property Management 428

Reestablishment of Monetary System 430

Command over Resources for Investment 432

Some Other Governmental Influences on a Private Ownership Economy, Short of Full-Scale Direct Controls 433

The Alternative to Viability 434

V. The Recuperation Phase 435

Recuperation Time 436

Recuperation Time: A Simple Model of Recuperation Possibilities 438

Qualifications to This Analysis 446

Absolute Levels of Destruction 446

Absolute Levels and Patterns of Survivor Productivity 447

Changes in the Natural Environment 448

Higher Transportation Costs 449

Survivor Disabilities 449

Summary 450

Organizational Aspects of Recuperation 450

VI. Conclusions 452

INTRODUCTION TO CHAPTER V 455

CHAPTER V: LOCAL GOVERNMENT IN THE U.S. AND THE U.S.S.R. UNDER STRESS: A COMPARATIVE VIEW OF SOME POLITICAL-ADMINISTRATIVE DIMENSIONS OF NUCLEAR ATTACK, Howard R. Swearer, University of California, Los Angeles 459

I. The Vulnerability of Political Institutions 459

Page

II. The Comparative Study of the United States and the Soviet Union: Methodological Issues in Assessing Vulnerability to Attack 463

The Use of Comparative Analysis 463

Local Government and Political Behavior 464

Assumptions about Attack Impact: The Generalized Case 466

Criteria of Vulnerability of Political Institutions 469

The Problem of Defining "Political Recovery" 471

Problems in Applying the Comparative Method to the American and Soviet Cases 474

The United States 474

The Soviet Union 475

III. A Comparative Overview of the American and Soviet Political Systems 482

Values and the Political System 484

The Soviet Case 484

The American Case 486

Soviet Vulnerabilities and American Vulnerabilities 488

Governmental Institutions and Personnel 491

The Soviet Case 491

The American Case 499

Possible Soviet and American Responses to Thermonuclear Disaster 502

Civil Defense and Vulnerability Reduction 503

The Soviet and American Cases 503

IV. Survival and Recovery of Political Institutions 512

Degree of Modernization as Related to Recovery: The Soviet and American Cases Compared 513

Long-Term Political Recovery 520

The American Case 520

The Soviet Case 526

The Need for Institutional Responses to Stress 531

Page

INTRODUCTION TO CHAPTER VI..... 533

CHAPTER VI: METHODOLOGICAL ISSUES IN THE SOCIAL ANALYSIS OF NUCLEAR ATTACK AND RECOVERY, Neil J. Smelser, University of California, Berkeley 539

I. Some Methods and Approaches from the Social Sciences..... 539

Methods of Scientific Explanation and Preciction 543

The Character of Scientific Inquiry 543

Explanation, Prediction, and Prophecy..... 548

Methods of Scientific Inquiry..... 551

Some Problems of Comparability in Different Socio-cultural Contexts..... 569

II. The Application of the Scientific Method to the Analysis of Post-Attack Society..... 583

The Ingredients of the Post-Attack Situation: Dependent and Independent Variables, Parameters and Operative Variables..... 583

Comparing Other Social Situations with Post-Attack Society 591

III. Types of Comparative Analysis in the Study of Nuclear Attack and Recovery 595

Types of Dependent Variables..... 596

The Number of Social Units Involved in Comparative Analysis..... 605

The Static or Dynamic Quality of Comparative Analysis..... 606

IV. Comparing Other Situations with Nuclear Attack and Recovery..... 608

The Impact Phase..... 617

The Shelter Phase 621

The Emergence Phase..... 630

The Adjustment Phase 636

The Recovery Phase 638

Page

The Refinement of Comparative Knowledge about Post-Attack Society 643

Theoretical Refinement: The Assessment of Role-Conflict and Its Consequences in Post-Attack Society 644

The Creation of Formal Models of Attack and Recovery 650

Part III: Some Applications to Planning

CHAPTER VII: SOCIAL DIMENSIONS AND DOMAINS IN PLANNING TO REDUCE VULNERABILITY: With Special Reference to the Uses and Effects of Shelter Systems
S. D. Vestermark, Jr. 659

The Place of Analytic Tools in Planning 659

Organization of This Chapter 663

General Principles for the Analysis of Post-Attack Social Domains 665

A Note on the Watts Riot of August, 1965 674

The Variable Salience of Institutional Domains and Decision Points in Planning: Some Empirical Findings on Maximizing the Post-Attack Social Inventory 698

Shelter Systems and Sequential Orderings of Post-Attack Behavioral Domains 701

An Inventory of Findings and Hypotheses About Possible Behavioral and Institutional Effects of Shelter Systems in Post-Attack Society 706

Maximizing and Managing Options for Using the Post-Attack Social Inventory, Within a Moving, Unstable Social Equilibrium System 721

The Question of Social Costs 724

LIST OF TABLES

		Page
Table I-1	Reactions to Atomic-Bombing of People in Atomic-Bombed Areas (as measured in late 1954)	16
Table I-2	Retrospective Assessments of Confidence in Fictory and Unwillingness to Continue War: Comparison of Responses in Atomic-Bombed Areas and Rest of Japan (as measured in late 1954)	17
Table I-3	Relative Morale of Hiroshima and Nagasaki and Four Groups of Japanese Cities Arranged in Order of Bomb Tonnage Dropped and Percent of Destruction (as measured in late 1954)	18
Table I-4	Factors Associated with Creation of Altruistic Norms and Behavior in Community Disaster - From Barton	53
Table I-5	Some Representative Dimensions for Describing Social Structure	130
Table III-1	Distribution of Preattack Population and Survivors of Holifield and Spadefork Attacks by Region, Metropolitan Residence, and size of Metropolitan Area for the U.S., 1962	290
Table III-2	Preattack Population and Percent of Survivors of Holifield and Spadefork Attacks by Region, Metropolitan Residence and Size of Metropolitan Area for the U.S., 1962	291
Table III-3	Years of School Completed by Both Sexes of the Population 25 Years Old and Over, by Region of Residence	298
Table III-4	Years of School Completed by Males of the Population 25 Years Old and Over, by Region of Residence	299
Table III-5	Years of School Completed by Males of the Population 25 Years Old and Over, by Urban Location in Daytime and Nighttime	300
Table III-6	Years of School Completed by Both Sexes of the Population 25 Years Old and Over, Among the Projected Survivors of Two Hypothetical Attacks	301

		Page
Table III-7	Years of School Completed by Males of the Population 25 Years Old and Over, Among the Projected Survivors of Two Hypothetical Attacks	302
Table III-8	Major Occupation Group of Employed Persons of Both Sexes, by Region of Residence	303
Table III-9	Major Occupation Group of Employed Males, by Region of Residence.	304
Table III-10	Major Occupation Group of Employed Males, by Urban Location in Daytime and Nighttime	305
Table III-11	Major Occupation Group of Employed Persons of Both Sexes, Among the Projected Survivors of Two Hypothetical Attacks	306
Table III-12	Major Occupation Group of Employed Males, Among the Projected Survivors of Two Hypothetical Attacks	307
Table IV-1	Concentration of Resources: Areas Ranked by Survival Industry	407
Table VI-1	Types of Comparative Analysis, with Illustrations for the Study of Post-Attack Society	607

LIST OF FIGURES

		Page
Figure I-1	Observable Systems of a Society, as Targets of Attack	36
Figure I-2a	Schematic Drawing of a Simplied Closed System, Showing Complete Interdependency of Components	41
Figure I-2b	Schematic Drawing of a Hypothetical Simulation Model of Coalition Formation, with Servo Capacity for Replay	41
Figure I-3	Some Basic Forms of Proposition	47
Figure I-4	Schematic Drawing of Emergent Pattern Formed by Potentially Closed System of Institutional Sectors: Sectors Described through Ordered Bodies of Propositions; Linkages among Sectors Indeterminate at the Level of Whole Sectors	61
Figure I-5	A Physical Source of Two Social Metaphors	71
Figure I-6	Final Elements of a Simple Aggregate Model for Determining Population "Viability"	92
Figure I-7	Degree of Situational Dependence of Elements in Hierarchies of Social Action Specification	111
Figure I-8	Post-Attack Functional Primacy of Four Systems of Society	115
Figure I-9	Hierarchies of Action Specification for Each Major Behavioral System of Society	121
Figure I-10	Paradigm of Levels of Governmental Need for Information on Possible Post-Attack Effects	167
Figure Ia-1	Comparison of Six Schemes for Defining Post-Attack Time Phases	198
Figure IIa-1	Primary Topical Emphases of Chapter II	209
Figure IIIa-1	Primary Topical Emphases of Chapter III	264

		Page
Figure III-1a	Urbanized Areas, 1960	267
Figure III-1b	Population Distribution, 1960	268
Figure III-2	The Estimated Populations of the United States and the Soviet Union Compared to that of Mainland China, Prior to and Following a Hypothetical Nuclear Attack in Late 1964-Early 1965 Causing 100 Million Fatalities in Both the United States and the Soviet Union	274
Figure III-3	Ten Most Populous Countries of the World, with Proportion of Total Population of Each Country in Major Metropolises (Cities or Urban Configurations of 500,000 and Over)	275
Figure III-4	Ten Most Populous Countries of the World Grouped by Degree of Industrialization, with Proportion of Total Population of Each Country in Major Metropolises (Cities or Urban Configurations of 500,000 and Over)	276
Figure III-5	Percentage of Total Population of Ten Most Populous Countries of the World Residing in Major Metropolises (500,000 and Over)	277
Figure III-6	Percentage of Total Population of Ten Most Populous Countries of the World Residing in Major Metropolises (500,000 and Over), with Countries Grouped by Degree of Industrialization	278
Figure III-7	The Proportion of Total Population in Major Metropolises (500,000 and Over) and in Cities or Urban Configurations of 100,000 through 499,999, for Nine of the Ten Most Populous Countries of the World, Grouped by Degree of Industrialization	279
Figure III-8	Estimated Population of the United States under Certain Assumptions, during the Sixty-Year Interval Following a Nuclear Attack Causing 100 Million Fatalities among a Population of 200 Million	283
Figure III-9	Age-Sex Pyramid Japan, 1950	285
Figure III-10	Age-Sex Pyramids, Soviet Union	286

		Page
Figure III-11	Age-Sex Pyramid United States, 1960	287
Figure IVa-1	Primary Topical Emphasis of Chapter IV	326
Figure IV-1	Success and Failure in Achieving Viability	392
Figure IV-2	Recuperation Time as a Function of Initial "Excess Capital"	443
Figure Va-1	Primary Topical Emphases of Chapter V	458
Figure VIa-1	Primary Topical Emphases in Chapter VI	538
Figure VI-1	Representative Chain of Dependencies among Classes of Variables	545
Figure VI-2	Hierarchy of Dependent Variable Types in Social Analysis	600
Figure VI-3	Schematic Representation of the Independent and Dependent Variables of the Experimental Situation and the Independent and Dependent Variables of the Control Situation	612
Figure VII-1a	Paradigm for a Stepped Progression: Sequential Appearance and Ordering of Determinants	681
Figure VII-1b	Paradigm for a Stepped Progression: Sequential Salience and Ordering of Determinants	681
Figure VII-2	Relations Among Determinants in a Sequential Ordering of Post-Attack Behavioral Domains: Constraints on a Shelter System	703

VULNERABILITIES OF SOCIAL STRUCTURE:
STUDIES OF THE SOCIAL DIMENSIONS OF NUCLEAR ATTACK

PART I

THE ANALYTIC TASK

(848 AD) On 4 February lightning flashed and thunder was heard as evening came on. The heathen, as was their custom, inflicted injury on the Christians. In the same year King Louis held an assembly of the people near Mainz. At this synod a heresy was brought forward by a few monks in regard to predestination. These were convicted and beaten, to their shame, before all the people. They were sent back to Gaul whence they had come, and thanks be to God, the condition of the Church remained uninjured. (849 AD) While King Louis was ill his army of Bavaria took its way against the Bohemians. Many of these were killed and the remainder withdrew, much humiliated, into their own country. The heathen from the North wrought havoc in Christendom as usual and grew greater in strength; but it is revolting to say any more of this matter. (850 AD) On January 1st, that is in the Octave of the Lord . . . Toward evening on that same day there was heard a great deal of thunder and a mighty flash of lightning was seen; and an overflow of water afflicted the human race during this winter. In the following summer an all too great heat of the sun burned the earth. . . . (852 AD) The steel of the heathen glistened; excessive heat; a famine followed. There was not fodder enough for the animals. The pasturage for the swine was more than sufficient. (853 AD) A great famine in Saxony so that many were forced to live on horse meat. (857 AD) A great plague of swelling blisters went through the people and consumed them with a loathsome rottenness so that their limbs fell off before they died.

From the Annals of Xanten, Ninth Century

This story shall the good man teach his son; . . .
From this day to the ending of the world,
But we in it shall be remembered ---
We few, we happy few, we band of brothers;
For he today that sheds his blood with me
Shall be my brother. Be he ne'er so vile,
This day shall gentle his condition;
And gentlemen in England now abed
Shall think themselves accursed they were not here,
And hold their manhoods cheap whiles any speaks
That fought with us upon Saint Crispin's day.

Henry V, Act IV, Scene III

Chapter I

SOCIAL VULNERABILITY AND RECOVERY AS ANALYTIC PROBLEMS

S. D. Vestermark, Jr.

I. Some Necessary Conceptual Ambiguities

Interactions Among Basic Problems

Those who ponder the social effects of thermonuclear war must consider two closely complementary sets of basic issues.

First, the human experience with the effects of nuclear weapons has been limited to sharply controlled field test situations, in the twenty years since the detonations above Hiroshima and Nagasaki.[1] While the consequences of the 1945 Japanese explosions were horrifying in themselves, the fact remains that there has been no experience with nuclear attacks aimed simultaneously at several metropolitan areas or at larger configurations or combinations of the components of industrial society. Thus, extrapolations or predictions about possible post-attack social phenomena cannot be subject to full empirical test. Within the present range of historical experience and available research techniques, predictions about post-attack social life have an inherent and as yet unknown degree of indeterminacy. The usual statistical uncertainties inherent in particular propositions derived from empirical evidence are compounded by ignorance about the very nature of the empirical evidence.

Second, the present state of knowledge in the social sciences does not permit the full description or prediction of many complex events resulting from the interactions among levels of the total set of social systems formed by society.

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[1] See, for example, Human Resources Research Office, DESERT ROCK IV: Reactions of an Armored Infantry Battalion to an Atomic Bomb Maneuver (Washington: Human Resources Research Office, The George Washington University, August, 1953, HumRRO TR-2), formerly classified "Confidential", declassified 16 November 1956, and Robert Vineberg, Human Factors in Tactical Nuclear Combat (Washington: Human Resources Research Office, The George Washington University, April, 1965, Technical Report 65-2).

Many interdependent problems of social theory, data, and method remain unsolved or, in some instances, only partially stated. Thus, the present knowledge in the social sciences does not permit a full statement or exploration of possible interrelations among the orders of possible post-attack phenomena which would be necessarily included in separate groups of predictions about post-attack life.

The events attending a large thermonuclear bombardment form one domain of uncertainties; the unresolved problems in describing and predicting events in complex social systems form another domain of uncertainties. When combined, these domains form an even larger domain of uncertainties, and the meaning of this domain becomes an important preoccupation for the analyst of thermonuclear attack.

"Panic", as an Illustrative Case. Consider the example provided by studies of panic in disasters. Responsible officials as well as the lay public have frequently believed that a sudden disaster affecting a large group will typically trigger a wild stampede of hysterical individuals who will seek any escape at any expense to others.[2] Analyses of cases of mass panic and related forms of collective outburst show, however, that panic is not an automatic reaction to a sudden real or imagined danger but that particular conditions, arranged in particular sequence, are associated with the panic outburst.[3] Several conditions contribute to a classic situation of panic.[4] Prior to the immediate cause of the panic behavior, the group likely to panic will have been rendered susceptible to

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[2] Enrico L. Quarantelli, "Images of Withdrawal Behavior in Disasters: Some Basic Misconceptions", Social Problems, VIII, 1 (Summer, 1960), pp. 68-79.

[3] Ibid. See also Enrico L. Quarantelli, "The Nature and Conditions of Panic", American Journal of Sociology, LX, 3 (November, 1954), pp. 267-275, and Neil J. Smelser, Theory of Collective Behavior (New York: The Free Press of Glencoe, 1963), esp. Ch. VI, "The Panic", pp. 131-169. See Smelser's discussion of the conditions attending panic in Chapter II, below.

[4] This discussion derives primarily from the sources cited in Footnote 3, above.

impulsive, individual movement by a lowering of the effectiveness of group structure and ties and by the development of external conditions which can expose this group to the experience of "danger". The lowering of the salience of group ties can occur relatively gradually, as in a local citizenry experiencing constant harassment and defeat in a war of attrition, or it can occur quickly, as in a rollicking crowd nightclubbing in a firetrap. Immediately before the onset of panic behavior, this susceptible group is confronted with a powerful and frequently ambiguous threat, which evokes within individuals the belief that imminent danger threatens them. To complete the progression of events toward panic, as awareness of a personal danger erupts in members of the group, individuals perceive further that escape is limited and that the possibility for escape is diminishing. Given these conditions, there is a strong likelihood that the group will wildly seek routes of personal escape.

Note that the primary reference of this description is to the relatively small collectivity of individuals, who can see each other. Even as this model of classic panic is stated in these terms, it is useful to ask how adequately it can be generalized to a true "mass" of individuals.[5] "True" panic may occur only in relatively small groups within a relatively restricted physical and social space. It may be more accurate to see larger phenomena which are often conveniently labeled "panics", (such as the financial panic or the mass population flight in the face of holocaust or invasion), as composed of varying elements with varying behavioral styles. Some sub-groupings may be composed of individuals in panic flight; other groupings may represent individuals engaged in organized, adaptive behavior.[6]

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[5] On the problems in shifting and blurring the analytic levels to which concepts refer, see, for example, S. D. Vestermark, Jr., "Social Science as Systematic Anxiety: A Case Study in the Civil Defense Dialogue", Journal of Conflict Resolution, IX, 2 (June, 1965), pp. 278-280.

[6] One of the most striking opportunities for examining limitations on the classic conditions of panic as they might occur in a mass population in industrial society was afforded by a sudden electric power failure which covered thousands of square miles in the most densely populated areas of the Northeastern United States during the night of November 9-10, 1965. The failure, which lasted

Certainly, the anecdotal evidence provided by witnesses to the Hiroshima bombing attests to the possibility that panic behavior occurred during the immediate aftermath of the attack. A Ninth Grade boy, in a Hiroshima Third Grade in 1945, writes:

> I was completely amazed. While I had been thinking it was only my house that had fallen down, I found that every house in the neighborhood was either completely or half-collapsed. The sky was like twilight. Pieces of paper and cloth were caught on the electric wires. In some places the wires were out and dangling. I went out to the garden patch behind the house. Five or six neighbors came dashing out. For the first time I noticed that my hand was injured. This was probably where I had got caught on a nail or something when the house collapsed. I washed the wound at the pump beside the garden and together with my mother

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(Footnote 6, continued) over thirteen hours in sectors of New York City, struck the City during the period of maximum evening travel home from work. According to a New York Times account (New York Times City Edition, November 11, 1965, p. 1, col. 5), "nearly 800,000 persons were trapped for hours in elevator shafts, subway trains and commuter trains". Elsewhere in the same edition of the Times, there are extensive reports of the adventure, fun, and mild confusion which the blackout provided. "Panic" and other forms of social disorder appeared to be strikingly infrequent. On the other hand, there was lavish reporting of adaptive behavior, including activities of private citizens in directing traffic and participating in rescues of trapped individuals. Incidents of panic appeared in some situations which conformed precisely to the classic conditions: thus, fears of suffocation "tormented many elevator prisoners" (Ibid., p. 37, col. 3) and, in the Skid Row section of the City, "there was a moment of panic" when police chased a man who bolted from a crowd of derelicts (Ibid., p. 37, col. 1).

As the present writer listened to radio reports of the blackout from a vantage point outside the blackout area of the Northeast, he noted instances later in the evening in which radio commentators appeared to feel constrained to speculate on why there had been no "panic". It seemed that these observers had a well developed "panic fantasy", which took no account of the varying levels at which group behavior may be organized, and that they were surprised when no panic occurred. In fact, other users of the radio medium may have alleviated some of the possible conditions for panic by sustained broadcasting of accurate information about the causes of the power failure and the steps being taken to remedy it. When analysts attempt a full reconstruction of the social history and human experiences during this power failure, the fact that some felt constrained to speculate about the lack of panic may turn out to be as significant as the seemingly more important fact, that "mass panic" did not occur. It may also be noteworthy that after the crisis had passed, there was much self-congratulation about the generally even-tempered responses of the public.

went out to the main street. On that street crowds were fleeing toward the west. Among them were many people whose hair was burned, whose clothes were torn and who had burns and injuries. We fled to the west with them. From the end of Kannoh Bridge we turned in the direction of Eba Park. Along the way the road was full to overflowing with victims, some with great wounds, some burned, and some who had lost the strength to move farther and were seated at the roadside with vacant faces.

While we were going along the embankment, a muddy rain that was dark and chilly began to fall. Around the houses I noticed automobiles and footballs, and all sorts of household stuff that had been tossed out, but there was no one who stopped to pick up a thing. Everyone was frantically intent on escaping.[7]

A doctor recorded that:

In the space of one night patients had become packed, like the rice in sushi, into every nook and cranny of the hospital. The majority were badly burned, a few severely injured. All were critically ill. Many had been near the heart of the city and in their efforts to flee managed to get only as far as the Communications Hospital before their strength failed. Others, from nearer by, came deliberately to seek treatment or because this building, standing alone where all else was destroyed, represented shelter and a place of refuge. They came as an avalanche and overran the hospital.[8]

Hersey reconstructs the events which took place at a wooded estate, suggesting its meaning as a place of refuge from terror:

All day, people poured into Asano Park. This private estate was far enough away from the explosion so that its bamboos, pines, laurel, and maples were still alive, and

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[7]Arata Osada (ed.), Children of the A-Bomb: The Testament of the Boys and Girls of Hiroshima, trans. by Jean Dan and Ruth Sieben-Morgen (New York: G. P. Putnam's Sons, 1959), p. 95 (from the account of Shunnen Arishige).

[8]Michihiko Hachiya, M. D., Hiroshima Diary: The Journal of a Japanese Physician, August 6 - September 30, 1945, trans. and ed. by Warner Wells, M. D. (Chapel Hill, N. C.: University of North Carolina Press, 1955), p. 11.

> the green place invited refugees --- partly because they believed that if the Americans came back, they would bomb only buildings; partly because the foliage seemed a center of coolness and life, and the estate's exquisitely precise rock gardens, with their quiet pools and arching bridges, were very Japanese, normal, secure; and also partly (according to some who were there) because of an irresistable, atavistic urge to hide under the leaves.[9]

Beyond their human poignance and tragedy, what do these accounts tell about the social impact of panic behavior in Hiroshima? In relation to other responses which were made in both the short run and long run following attack, the significance of panic behavior can have several levels of meaning.

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[9] John Hersey, Hiroshima (New York: Alfred A. Knopf, 1963), p. 47. Later in this account of events at Asano Park, Hersey describes an outburst of disorganized behavior:

> Early in the afternoon, the fire swept into the woods of Asano Park. The first Mr. Tanimoto knew of it was when, returning in his boat, he saw that a great number of people had moved toward the riverside. On touching the bank, he went up to investigate, and when he saw the fire, he shouted, "All the young men who are not badly hurt come with me!" Father Kleinsorge moved Father Schiffer and Father LaSalle close to the edge of the river and asked people there to get them across if the fire came too near, and then joined Tanimoto's volunteers. Mr. Tanimoto sent some to look for buckets and basins and told others to beat the burning underbrush with their clothes; when utensils were at hand, he formed a bucket chain from one of the pools in the rock gardens. The team fought the fire for more than two hours, and gradually defeated the flames. As Mr. Tanimoto's men worked, the frightened people in the park pressed closer and closer to the river, and finally the mob began to force some of the unfortunates who were on the very bank into the water. Among those driven into the river and drowned were Mrs. Matsumoto, of the Methodist School, and her daughter. (Ibid., pp. 50-51.)

In his careful analysis of existing evidence on group reactions to the bombings at Hiroshima and Nagasaki, Janis cites this report by Hersey of the fear at the fire in Asano Park as the only example of "group panic or near-panic" that he could find in the published accounts of the Hiroshima atomic disaster which were available to him. Irving L. Janis, Air War and Emotional Stress (New York: McGraw-Hill, 1951), pp. 37-38.

"Significance" means, first, that there were sufficient incidents of panic behavior to warrant the analyst's saying that panic behavior could be taken as one of the centrally defining traits of the total constellation of responses made to the Hiroshima and Nagasaki attacks. Within just the accounts given here, it is clear that panic was not a universal or even necessarily widespread response, either in groups at a given moment or in an individual experiencing varied reactions over time. Perhaps through a retrospective psychological filter, the Ninth Grade boy recalls that he washed his wound "at the pump beside the garden", even as he was about to join a fleeing group. The doctor notes that "Others, from nearer by, came deliberately to seek treatment". It was the terrible crowd --- not necessarily a panic --- that made a human avalanche that "overran the hospital". Some of the individuals hiding in Asano Park hid there, Hersey reports, because of the not unreasonable belief that "if the Americans came back, they would bomb only buildings". There are many evidences of order in the Hiroshima horror. The evidence of these anecdotes is borne out in more systematic studies of the range of reactions in the populations of Hiroshima and Nagasaki.[10]

After a review of available evidence, with special reference to both the U. S. Strategic Bombing Survey and eyewitness reconstructions, Janis concludes:

> Thus, although we cannot exclude the possibility that the respondents may have intentionally or unintentionally distorted the truth, the fact remains that the findings from the USSBS interviews, like the intensive case studies recorded by Hersey, provide no substantial support for generalizations about disorganized overt behavior.

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[10] See ibid., especially Part I, "Reactions at Hiroshima and Nagasaki". For a summary of studies of responses to nuclear explosions, including possible panic, see Peter G. Nordlie and Robert D. Popper, Social Phenomena in a Post-Nuclear Attack Situation: Synopses of Likely Social Effects of the Physical Damage (Arlington, Va.: Human Sciences Research, Inc., 1961), pp. 15-19.

The present discussion of anecdotal evidence draws upon the Hiroshima evidence; the evidence from Nagasaki closely parallels this evidence.

... Was there "mass panic" during the atomic disasters? Only a very tentative and highly qualified answer can be given. If "panic" is defined in terms of inappropriate or socially negligent behavior, we can point to only one clear-cut instance where a sizeable group of Hiroshima survivors behaved in such a way .... We also know that there were at least a few individuals who, in a state of acute terror, behaved impulsively, and perhaps irrationally, for a brief period of time. These few instances, when viewed in the context of a high incidence of anxiety feelings, create the presumption that there may have been a tendency for many people to lose the normal restraints that ordinarily govern their behavior. Under the catastrophic conditions of an atomic disaster, when so many people are in a state of acute excitement, it is to be expected that the threshold for uncontrolled, disorganized action would generally be much lower than normal. When obvious escape routes are not apparent, many individuals, temporarily dominated by powerful emotional impulses, might engage in frantic efforts to attain safety without regard for the negative consequences of their behavior. Excited stampedes and other typical manifestations of mass panic could easily be touched off by a multiplicity of threatening circumstances that ordinarily, when encountered singly, would not evoke such behavior.

The available evidence suggests that there probably was a latent disposition of this kind among the survivors at Hiroshima and Nagasaki. But how often did it break through into actual behavior? ... When the thousands of refugees were evacuating the flaming target areas, were they so terror stricken that they were unable to control maladaptive impulses? Or did they generally tend to maintain a fairly high level of ego control and act in a way that maximized their chances of survival? ...

As is all too apparent from the laborious review of the fragmentary evidence, we simply do not have the answers to these questions of historical fact. If a tentative conclusion were to be drawn in the light of the meager information available, it would be the following: It is probable that overt panic and extreme disorganized behavior occurred in some local circumstances during the two atomic disasters, but it is

unlikely that such behavior was widely prevalent among the hundreds of thousands who survived the atomic explosions.[11]

If "significance" means, substantively, "importance as a defining characteristic which occurs widely and frequently", then panic behavior does not appear to have been a significant element in the social responses to the bombings at Hiroshima and Nagasaki. But this may be an overly restrictive way of defining "significance". Panic behavior could contribute to the vulnerability of the population even if it were not a principal, visible response. As the cited anecdotes suggest, panic behavior might occur at points of crucial confluence --- such as hospitals, communications centers, road junctions, local environmental boundaries, strongly reinforced buildings --- and interfere with or block adaptive measures being organized at these points. It is conceivable that in the future, relatively small incidents of panic behavior might have multiple effects throughout a system which is dependent on events occurring at the panic point. On the other hand, it could be argued that a large-scale atomic disaster, by rupturing linkages among control centers and isolating components of the social network, might not permit the same degree of multiple effects of panic as could be produced in a society subject to panic fear but without physical damage.[12]

In another sense this definition of "significance" may be misleading. Panic behavior may have been an important feature of the behaviors of individuals which led to acceleration of short-term damage from blast, fire and radiation. If panic crushes occurred among groups of individuals who were soon to die or be obliterated, they could not be reported by survivors. Any deaths due to panic

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[11] Janis, op. cit., pp. 40-41.

[12] Here it is interesting to speculate on what might have happened if the tone of public information disseminated to the Northeast blackout area described in Footnote 6 above had been alarmist and fear-arousing. There is some reason to think that more instances of panic might have arisen; yet, there is also evidence that many individuals did not receive public information broadcast to them, but still went on about their business as best they could.

would be observable retrospectively primarily as they contributed to the aggregate post-attack demography of the population, as measured in estimated total mortality and casualty figures. This may seem to be a minor point when gross damage to centers of target areas is being considered; it may be less trivial when measures are considered for maximizing survival of human lives in physical and social areas marginal to target centers. The final demographic toll will be a complex resultant of particular processes within the social structure as well as of particular events occurring to individuals treated as units for counting purposes. Population survival measures include not only reducing the direct vulnerability of groups to physical attack effects and developing post-attack population management policies, but also controlling features of the social structure which may accelerate or decelerate individual reactions to the facts of physical attack. Social damage assessments which divert attention to the characteristics of a whole surviving population may neglect the social processes which produce this final composition of traits.

In still another sense, it may be difficult to define the "significance" of the apparent low incidence of panic events at Hiroshima and Nagasaki. A primary reason for studying these two cities so long after the fact is to develop information which might serve as the basis for inferring responses of other populations to future attacks. Here, the process of extrapolating evidence from Hiroshima and Nagasaki raises complex questions about the meaning of the apparent low incidence of panic in these two Japanese cities at the end of World War II. The atomic bombings occurred in cities which had not been forewarned. These cities, however, were located in a society experiencing increasing pressures on its institutions, as an imperialistic war became a war of attrition against the homeland. The population of Japan had had the experience of increasing sacrifice, in a hierarchical, disciplined social system. In what ways might this experience have been translated to the immediate responses of the Hiroshima and Nagasaki populations? Did the collective characteristics of the Japanese culture, social system, and wartime experience, when combined, emerge in a local population so as to dampen --- or heighten --- panic behavior after a sudden attack? Is the behavior of Hiroshima and Nagasaki to be taken as evidence that panic responses

were dampened? Or, is it to be inferred that if more evidence were available for more explicit and comprehensive reconstructions of events, the panic behavior that did occur was evidence of a greater likelihood of panic, when Hiroshima and Nagasaki are compared with Japanese cities that received conventional bombings or with cities in other cultures that might receive nuclear bombings?

When put this way, these questions are almost impossible to answer usefully, even though as questions of comparative social science, they remain provocative. The very small number of cases of atomic bombing in Japan, the absence of any cases in another culture, and the difficulty of individually and comparatively segregating and describing all significant aspects of a large social system suddenly brought under massive stress make it difficult to provide other than post hoc speculative answers.

There is, however, a more general, indirect kind of evidence available; these data can suggest to the analyst whether Hiroshima and Nagasaki so markedly differed in their social responses to nuclear attack as to provide presumptive evidence that, within the Japanese cultural experience, atomic bombing introduced a new order of social consequences from air attack. The United States Strategic Bombing Survey found that Hiroshima and Nagasaki interviewees, looking retrospectively, most frequently reported fear and terror as their reactions to the atomic bombings. Table I-1 (p. 16) gives the full variety of responses; it is possibly revealing of respondents' values that in addition to fear and hatred being reported, twenty-six percent of the respondents reported admiration for the technical achievement, while three percent expressed jealousy. Yet, when the Hiroshima and Nagasaki populations are compared to other Japanese populations on measures of "morale", the sample of these two populations gave retrospective answers which indicated higher morale. Table I-2 (p. 17) compares Hiroshima and Nagasaki with the rest of Japan, on such measures of morale as degree of confidence in victory and extent of unwillingness to continue the war. Table I-3 (p. 18) splits the Hiroshima and Nagasaki populations and four other types of

Table I-1

REACTIONS TO ATOMIC-BOMBING OF
PEOPLE IN ATOMIC-BOMBED AREAS
(as measured in late 1945)

	Percent:
Fear-terror	47
Fear for own life	16
Admiration-impressed by bombs' physical power, by the scientific power behind the bomb	26
Jealousy-Why couldn't Japan make such a bomb?	3
Anger-bomb is cruel, inhuman, barbarous	17
Hate of U.S. specifically because of atom bomb use	2
No reaction indicated	11

(The total percentage equals more than 100, because many respondents gave more than one answer.)

Source: United States Strategic Bombing Survey (Morale Division), The Effects of Strategic Bombing on Japanese Morale (Washington: U.S. Government Printing Office, 1947), Table 83, p. 92.

Table I-2

RETROSPECTIVE ASSESSMENTS OF CONFIDENCE IN VICTORY AND UNWILLINGNESS TO CONTINUE WAR: COMPARISON OF RESPONSES IN ATOMIC-BOMBED AREAS AND REST OF JAPAN
(as measured in late 1945)

	Percent in:	
	Hiroshima and Nagasaki areas	Rest of Japan
Percent who said they never had doubts of victory	19	11
Percent who said they were never certain that Japan could not win	27	26
Percent who said they were never personally unwilling to continue the war	39	28

Source: United States Strategic Bombing Survey (Morale Division), The Effects of Strategic Bombing on Japanese Morale (Washington: U. S. Government Printing Office, 1947), Table 84, p. 95.

Table I-3

RELATIVE MORALE OF HIROSHIMA AND NAGASAKI AND FOUR GROUPS OF JAPANESE CITIES ARRANGED IN ORDER OF BOMB TONNAGE DROPPED AND PERCENT OF DESTRUCTION [1]
(as measured in late 1945)

	Percent with:	
	Relatively low morale	Relatively high morale
Heavily bombed cities, exclusive of Tokyo[2]	56	44
Medium bombed cities, high percent of destruction	51	49
Medium bombed cities, low percent of destruction	46	54
Lightly bombed and unbombed cities	47	53
Hiroshima and Nagasaki	45	55

[1] Measure of morale used is the Morale Index (cf. Appendix K, U.S. Strategic Bombing Survey, The Effects of Strategic Bombing on Japanese Morale). The two morale groups in this table each represent roughly half the sample, when arranged in order of scores on the Morale Index.

[2] Morale scores for Tokyo are not presented here because it reacted quite differently (i.e., showed relatively higher morale) from the rest of the heavily bombed cities in Japan. Cf. ibid., Ch. 5, esp. pp. 50-51.

Source: United States Strategic Bombing Survey (Morale Division), The Effects of Strategic Bombing on Japanese Morale (Washington: U.S. Government Printing Office, 1947), Table 85, p. 95.

target population, according to whether respondents in each target type showed "relatively low morale" or "relatively high morale".

While some differences are not great, the trend is for Hiroshima and Nagasaki to score higher on morale indicators. While not unexpectedly the Hiroshima and Nagasaki respondents frequently reported themselves to have been terrified at the atomic bombings, they also reveal themselves to have had a level of attitude toward the war not at marked variance with populations which did not suffer atomic bombing. If anything, Hiroshima and Nagasaki respondents were less discouraged about the war, according to their retrospective accounts.[13]

At this point, the inquiry has broadened even further, for, whatever the immediate social-behavioral responses of the Hiroshima and Nagasaki populations, it would appear that the atomic bombings did not introduce a distinctive, long term, new effect into the behavior or attitudes of the survivors.[14] Whether or not incidents of panic did occur as a distinctive result of the suddenness and magnitude of atomic bombing occurring within a wartime Japanese society appears immaterial, when the attitudes and behaviors of a sample of the surviving populations are compared with other Japanese populations. The Hiroshima and Nagasaki populations appear to have emerged from their experiences with no

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[13] Janis comments on the Strategic Bombing Survey:

> The report by the Morale Division, which presents the findings from a systematic analysis of all the interviews, makes no mention whatsoever of aimless or disorganized behavior. As will be described shortly, the morale interviews do not, in fact, provide substantial support for the claim that a sizeable proportion of the population behaved in an ineffective or distraught way, even though they do indicate that many people felt momentarily terrified or fearful. In only a few cases could one surmise from the individual's statement that he or she might have exhibited uncontrolled emotional behavior; in most cases, such an inference could not be drawn without resorting to extremely tenuous, speculative assumptions.

Janis, op. cit., p. 31.

[14] And see ibid., pp. 54-66.

distinctive, debilitating block to their participation in longer term recovery efforts. Therefore, for the analyst concerned with the social-behavioral consequences of differing weapons of large magnitude, the significant finding is that the behavioral and attitudinal responses of the populations subjected to nuclear attack were not significantly adversely different.

Up to this stage, the question of the "significance" of possible panic behavior has moved through several levels of redefinition. The issue opened in a consideration of whether panic behavior did occur. The evidence was that panic was, quantitatively, a minor phenomenon --- thus, maladaptive, disorganized, panic reactions were not significant. But, perhaps the quantitatively observable incidents of panic were so masked that they could appear only indirectly, as they are reflected in aggregate characteristics uncovered by a demographic inventory of the post-attack population. The demographic inventorying of a post-attack population could not label all of the thousands of behavioral events which led to its final aggregate findings. Already, then, the question of "significance" has moved from anecdotal reporting and behavioral assessment to questions of finding adequate indicators of events in a large population. Considering this large population as a social system introduces further issues. Small incidents of panic may be critically significant in the functioning of a large system. If so, there is an immediate policy and systems design implication: Although panic may be infrequent, it can be so critical to system effectiveness that seemingly disproportionate efforts should be mounted to guard in advance against a relatively small number of behavioral events.[15] In what respect can panic behavior be considered an "input" to the events in a social system? Another order of description is required to examine this question: The parts of a social system must be described in relation to each other,

[15] Insofar as complex adaptive efforts within a partially ruptured social system can be hindered by panic behavior resulting in overload or chaos, a degree of desirable panic reduction could become an important countermeasure systems design criterion. This implies that some adequate projection of the likelihood of panic behavior and its expected location can be provided. On the meaning of "criterion" here, see Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age (Cambridge: Harvard University Press, 1963), Ch. 9, "The Criterion Problem", pp. 158-181.

and the evidence pertaining to behavior of these parts must be cast in such a form as to permit extrapolation from past events to unknown future events occurring within the social system as it is projected to be at that time. Here, however, the evidence on nuclear attack becomes elusive, because of its scarcity and because of the difficulties in insuring full comparisons among cultures, social systems, and massive disasters. The evidence on Hiroshima and Nagasaki thus brings the question of "significance" full circle, for it suggests that whatever did occur at Hiroshima and Nagasaki, the populations survived with a basis for recovery not significantly different from the emotional resources in the remainder of the Japanese population. If this is so, the analyst must then say that at this level of attack, the atomic weapon introduced no new, distinctive disaster phenomena and, by inference, no distinctive panic phenomena. Would this hold true if the attack magnitude had been increased? Would this hold true if, regardless of weapons used, the attack magnitude could have been increased? Perhaps if the attack magnitude were increased, behavioral phenomena --- such as group panic --- would be less important for events which must be seen as occurring not merely to individuals or group collectivities, but to the whole social system as a social system. Is there a point at which the social system itself would "collapse"? At lower levels of attack, is there any real utility in trying to describe dimensions along which panic may occur and in trying to design systems to control it? At lower levels, is the likelihood of critically significant panic so low as to make it an insignificant policy and systems design problem?

Goals of the Present Volume of Studies. The purpose of this excursion into the evidence on behavior at Hiroshima and Nagasaki has not been to achieve a series of conclusions about whether panic did occur then or will occur elsewhere in the future. Rather, the purpose has been to raise realistically the kinds of questions with which this present volume of studies must be concerned.

There is a relatively large and useful group of analyses of panic in disaster; social scientists have been fascinated with panic events because these events offer clues into the ways social structural constraints influence human behavior --- or decline in influence at times of stress. For many analysts, such

events are intriguing because of the apparent rapidity with which "organized" behavior becomes apparently "disorganized", "functional" behavior becomes "dysfunctional", and the "rational" dissolves into the "irrational". Among the public --- including relatively sophisticated officials --- "panic" behavior appears as a frequent fantasy expectation about human behavior subjected to sudden stress. For such reasons, panic behavior has received special attention in studies of both nuclear and non-nuclear disasters. The findings of social scientists have emphasized the constraints on panic, the need for careful differentiations among forms of collective behavior, and the predispositional myths which make "panic" seem a priori to be such an important potential element of the behavior of a disaster-stricken population. The evidence seems to warrant the prediction that except under a series of precisely interlocking conditions, mass panic is unlikely to occur in a population subject to nuclear attack. The knowledge that panic is associated with specifiable conditions will suggest to the planner and administrator that if they take steps to control these conditions, they can control and redirect potential panic behavior.

On another level of analysis, however, the basic lesson of this excursion is that so many important analytic questions remain. If panic is the result of a series of interlocking events in a specific group of individuals, will general inventories of the social structure and population-at-large enable the analyst to predict the broad areas within which panic is likely to occur? What are the dimensions of social structure and population which will enable the analyst to predict the particular composition of particular groups, so that individuals faced with controlling panic can know simultaneously its potential scope in a stricken area and its particular manifestations which will require particular resources of control? How are the general dimensions of social structure and population which might influence the composition of particular panic-prone groups influenced, in turn, by events in other dimensions of the society which do not seem directly related to the causes of "panic"? Do the economy or the value system of a society act as orders of constraint which meaningfully influence the social structural and population dimensions of group formation? Would knowing something about the state of a society's economy or its value system tell the analyst something

significant, even though indirectly, about the kinds of disorganized, dysfunctional group responses to expect after a disaster? Now the analysis moves away from the particular study of panic events and toward the whole range of events that may occur in a society subjected to massive disaster. Answers about panic may depend, in the end, on answers to questions about the potential behavior of many other sectors of the society.

In view of the scope of such analytic problems, the goals of the present volume of studies remain relatively modest. These studies are attempts to add to the knowledge of possible social effects of thermonuclear attack upon American society. Yet a central motif of all these studies is the difficulty of the analytic problems that must be faced, if "knowledge" is to mean more than a series of scattered inductions based on imperfectly interrelated varieties of direct and indirect evidence. Therefore, the task of relating varying orders of evidence about thermonuclear attack, in ways which will point beyond the amassing of scattered groups of propositions about potential effects, is a central task of these studies. Fundamental to this task is the development of the conceptual and analytic tools which will suggest interrelations among not only the thousands of potential acts of behavior in a complex society, but among the larger institutional complexes of society which reciprocally shape specific acts of behavior. Post-attack events as well as the life of pre-attack society must be seen as resulting from several levels of determinants. Since the proper statement of these determinants is the task of not only these studies of post-attack events but, more generally, of attempts to develop a social science, the essays in this volume necessarily address many unresolved problems in the social sciences. Throughout these essays, there will be manifest a concern with the meanings of knowledge in the social sciences and with the varieties of methods available for attaining this knowledge.

This chapter continues with a discussion of some of the basic problems in developing concepts with which to frame inquiries about social effects of thermonuclear attack. After a brief discussion of the general styles of thought imposed by some available models for thinking about society and social behavior, the discussion turns to the special place of metaphor in thinking about imperfectly

understand events. Moving on to the second part of the chapter, the analysis outlines the basic type of knowledge which will be perhaps the most significant target of these studies: the critical classes, ranges, and limits of behavioral events governed by social institutions, and the dimensions of vulnerability which these classes, ranges, and limits form. With such knowledge, it is more meaningful to speak of states of the society and the social system as determinants of post-attack social phenomena; states of society and the social system become criteria for civil defense planning to reduce vulnerabilities to nuclear attack. This chapter concludes with a discussion of the particular types of knowledge about post-attack worlds that may be both feasible for social scientists and useful for planners. Here there will be special attention to the rationale for developing institutional criteria for analyzing social systems. It will be argued that criteria at the institutional level are necessary for the design of systems to protect large groups of individuals and to guide post-attack events in society.

It will be proposed that the five studies which form Part II of this volume are "criterion" essays which suggest crucial domains of possible post-attack events, with which planners must contend if they are to preserve the valued characteristics of American society. The description of these domains provides part of the groundwork for a more detailed answer, in Part III, to the problems of saying how, in general, a society may be "vulnerable" to massive stress and how, in turn, measures may be generally conceived for reducing a constellation of institutional vulnerabilities and directing action toward states of "recovery".

The reader of these studies of "societal vulnerability" will note a paradoxically dual basic purpose. To develop ways of making more reputable projections of the possible ranges of events in society following nuclear attack, so that planners can know the likely dimensions of human response and the likely orders of demand which will be placed on systems of recovery, fundamental questions of describing and modeling complex society must be pursued. It will be seen later that planning and administrative questions of immediate, applied importance depend on the conduct of inquiries which stretch toward the domains

of the speculative and the unknown. Thus the philosophers once more assist the guardians of the commonwealth, for, as Plato wrote,

> The name of philosopher, then, will be reserved for those whose affections are set, in every case, on the reality. [16]

Some Available Conceptual Techniques

The task is, then, to establish an intellectual basis for projecting possible social effects of nuclear attack. These possible social effects include not only individual behavioral responses but group and collective phenomena and institutional processes and changes. To remain true to the realities of complex industrial society, attempts to describe possible social effects must utilize not only domains of detailed empirical data on likely individual responses but also sources of information about the ways in which these individual responses may be influenced by structural features and group and individual life beyond the individual. But how can the analyst transcend the particularities of evidence about individual behavior, and show it in its proper relation to the characteristics of social life over which any one individual has only partial relevance, partial affect, partial control?

While the discussion of the meaning of evidence about panic behavior at Hiroshima and Nagasaki opened several questions about the levels at which it is necessary to interpret evidence about human behavior, a fundamental issue remains. This issue often takes the form of a confusion or an uncertainty about the extent to which the analyst deals with realities when he deals with human behavior. The following passage from a working paper on civil defense reflects this problem:

> We use the term, "social system", in its broadest sense as it applies to the United States: the whole Nation, including people, facilities, materials, energy and organization. People in this case are social beings --- members of groups --- rather than individuals. And it is important to remember that each individual often belongs to more than one group.

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[16] Plato, The Republic, trans. and with introduction by Francis M. Cornford (New York: Oxford University Press, 1950), Book V, p. 189.

> What we need to know about the social system as an input varies with its several parts or systems. Generally, we need to know about anything that would be damaged by enemy attack. This means people, facilities and materials --- physical things --- of course, but it also means abstractions, such as relationships, rights, beliefs and so on.[17]

This sharp separation of "physical things" from "abstractions" obscures the ways in which acts of human behavior are both "physical" and "abstract" in their properties. As properties of individual human actors, behavioral acts are visible characteristics of physical beings, which can be altered by direct physical blows. As the basic pieces of evidence about the existence of social structure, interpersonal relationships, and systems of ideas or beliefs, however, behavioral acts form the primary data from which inferences and concepts --- abstractions --- about social life are constructed. As clues to the existence of social systems, acts of behavior by physical, behaving organisms exhibit the properties which lead the analyst to infer the existence of social structural and cultural facts. By being analytic constructions from behavioral evidence as well as material artifacts, "relationships", "rights", "beliefs", and social structure are no less "real" than those physical entities, such as "people", "facilities", and "materials", which form physical targets. Yet, since physical things and their properties must be the primary targets of a physical attack with weapons systems, it becomes difficult to see the ways in which social life becomes a target, if the phenomena of social life are treated as "abstractions" without further clarification. In looking at physical effects contrasted with "abstractions", "abstractions" must necessarily seem intangible and elusive.

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[17] John F. Devaney, Systems Analysis in Civil Defense: Parts I and II (Washington: U. S. Department of Defense, Office of Civil Defense Research Directorate, [1963]), pp. 20-21 (emphasis added). While this paper provides a useful basic inventory of concepts by a specialist in the information required for the design of civil defense systems, the title page to this offset-printed document contains this notice: "This is a working p. per. It may be expanded modified (sic) or withdrawn at any time. The views, conclusions or recommendations expressed herein do not necessarily reflect the official views or policies of the Office of Civil Defense".

The danger implied by the separation of the "physical" from the "abstract" lies in the possibility that the analyst will misunderstand the kind of scientific nominalism necessary to infer the existence of social structure from individual acts of behavior and individual artifacts of material or symbolic culture.[18] The reality of the patternings of social life which lead the analyst to infer the existence of a social structure and a symbolic culture in a society does not depend on this process of abstracting from physical-behavioral evidence, even though this reality can be revealed only by a process of abstraction.[19] Such a process of abstraction develops orders of concepts for labeling and analytically manipulating the characteristics of the social structure; in a sense entirely consonant with conventional discussions of "things", this process of conceptual analysis reveals a domain of "things".[20] The first task in analyzing the social effects of nuclear attack is to determine the kinds of social things that come under attack. But how can they come under attack in the sense that "physical things", as conventionally described, come under attack?

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[18] A similar danger exists in distinguishing the physical effects of a tack as "direct" effects while consigning all social effects to the category of "indirect" effects. "Indirect" can mean "effects upon social structure inferred from changes in individual actors". It can also mean secondary, in the sense that the indirect effect is contingent upon a prior sequence of events, beginning in a primary effect. To speak of social effects as being, sui generis, "indirect" effects both confuses the meaning of "primary" and "secondary" effects and fails to clarify the ways in which social effects can be inferred from primary and secondary "physical" damage. In addition, there can be also the implication that as "indirect" effects, social effects are less important than primary physical effects.

[19] A frequently encountered confusion about the meaning of "abstraction" is found in the proposition that if a thing can be known only through abstraction, that thing itself is only an "idea" or an "intangible" in its true nature. Some form of this proposition provides the foundation for many systems of philosophical idealism.

[20] In a classic address to the problem of establishing the nature of evidence about social life, Durkheim strikes for the heart of the issue in these words: "The first and most fundamental rule is: Consider social facts as things". Emile Durkheim, The Rules of Sociological Method, trans. by Sarah A. Solovay and John H. Mueller and ed. by George E. G. Catlin (Eighth ed.; Glencoe, Ill.: The Free Press, 1950), p. 14 (emphasis in original). See also the discussion in the remainder of Chapter II, "Rules for the Observation of Social Facts", pp. 14-46.

Here a clarifying distinction is needed, a distinction that recognizes that the analyst of society will need to abstract from physically observable evidence in order to reach some of his conclusions about social structural damage. A look at the ways in which the individual human being is a target will suggest the kind of distinction needed.

It is the behavior of the individual human actor which provides the social analyst with his primary evidence about the events occurring within orders of social phenomena beyond the level of the observable human. So, also, is the individual human actor the primary social target of physical weapons effects. The individual's characteristics as social target necessarily stem from his several traits as a behaving organism.

Analytically stripped for the moment of more complex attributes, the individual actor is, first and last, a biological organism, with physical qualities and physical boundaries, and with capacities for ranges of behavior. As a biological organism, the individual reproduces, to form a population of behaving, biological organisms. The extent to which this population of biological entities endures over time will be a result of not only the reproductive capacities of individuals and groups but also of the abilities of the emerging biological population to establish a life-supportive system of relations with its non-human, physical environment. For a human population, the development of this life-supportive relation will depend upon some symbolic-manipulative mode for enhancing man's basic mechanical powers over the environment. Such modes become manifest even in the most unsophisticated human populations, formed of primal family bands roaming and hunting over their lands.

As biological entities, individual human actors can be seen for analytic purposes as individual systems, each one a discretely defined, continuing organism in continuing relation with its environment. When a population of these entities has achieved such a degree of continuing balance with its non-human environment that, short of unanticipated catastrophe, it can maintain itself

indefinitely, it has become an ecological system.[21] Both of these categories of system are formed from individual human entities; both depend upon the physically defined human organism to exist as a discrete entity and to participate in the conditions for maintaining himself, as a physical entity in a physical world. Both depend upon individuals to create ecological balances so that further individuals can be created. As both individuals and as a population of individuals, the human actors of society therefore form an analytic category of organic entity targets.

As physically definable entities, humans possess physically observable traits in addition to their gross structural traits as biological entities or participants in an ecological system. Among these traits are the many items of readily observable behavior which the human organism emits, as he examines and interprets his world and forms patterns of interaction with other humans.[22] Analysts sometimes encounter difficulty in seeing these items of behavioral output as "physical", however, since behavior --- like music, as opposed to the completed work of visual art --- occurs over time. If the individual behaving organism were to be observed in temporal cross-section, at an instant in time, he would be seen in an arrested pose, as in a snapshot. Analysts as well as photographers and visual artists know, of course, that this instant, frozen pose is only one in the ongoing stream of the individual actor's behavioral repertory. Yet, behavior can be known through cross-sections of it taken at "temporal instants". Together, these cross-sections of ongoing behavior reveal the human actor in a variety of physically observable and describable states --- whether he is manipulating the environment with his hand, gesturing to another person, or creating a pattern of

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[21] This is a somewhat broader use of the ecological orientation than is customarily found in post-attack studies. Studies of the post-attack ecological setting tend to examine conditions for possible post-attack alterations in the specific natural balances which stabilize the physical environment of human or non-human animal populations. See, for example, H. H. Mitchell, Floods and the "Postattack Biology Problem": A Preliminary Survey (Santa Monica, Calif.: The RAND Corporation, RM-4238-TAB, January, 1965).

[22] While the language and intent will shift somewhat later in this discussion, the immediate discussion certainly draws upon the point of view taken in several schools of "behaviorist" psychology.

symbols within his symbolic culture. Whether observed cross-sectionally in time or described in "real" time, items of behavior provide the idiom within which the human organism "lives" in a social-physical environment.

While these items of behavior represent the behavioral outputs of individuals, patternings of items of behavior produced by groups of individuals direct the analyst's attention to a level of behavioral entities beyond the isolated individual. In groups, individuals form not only populations in the sense of ecological system, but they also exhibit collective properties, properties drawn from the behavioral outputs of individuals but not necessarily dependent for their stability on the acts of any one particular individual. These properties are known from the individual acts of participant actors; but, from patterns formed by the interactions of actors through social roles and intermediate forms of group organization, the analyst can demonstrate the stability of these collective characteristics and show how these characteristics point to the existence of a system which constrains individuals.

The system to be discerned from the interaction of actors in stable patterns of role and organization existing over time is the social system. Here, "social system" is taken in a very general and elementary meaning: the total structure of interpersonal relations which both provides and reflects the organization of individual behavior into social roles, primary groups, kinship networks, secondary groups, associations, organizations, and class and status positions, as well as into categories of relatively less clearly specified and transitory groupings. Depending upon the theoretical persuasion of the analyst, this whole structure of relations will provide within a society a social structure with more or less coherence and integration, with more or less predictability in ordering determinants of individual behavior. In all cases, however, the social structure, composed of various levels and forms of social systems uniting in one total social system, is a pattern of behavior abstracted analytically from acts of individual behavior.[23]

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[23] As will become clearer later in this chapter and volume, the dominant orientation which has guided the analytic approach taken here toward patternings of behavioral determinants and social structure has been a body of contemporary functional theory in sociology. See Talcott Parsons, The Social System (Glencoe,

These acts are observable as visible traits of the human organism. When the

(Footnote 23, continued) Ill.: The Free Press, 1951); Talcott Parsons and Edward A. Shils (eds.), Toward a General Theory of Action (Cambridge: Harvard University Press, 1954); and Talcott Parsons and Neil J. Smelser, Economy and Society: A Study in the Integration of Economic and Social Theory (Glencoe, Ill.: The Free Press, 1956). Also see Talcott Parsons, "An Outline of the Social System" in Talcott Parsons et al. (eds.), Theories of Society: Foundations of Modern Sociological Theory (New York: The Free Press of Glencoe, 1961), Vol. I, pp. 30-79. For a specific development of the concept of a hierarchy of behavioral determinants, see Neil J. Smelser's discussion of "The Hierarchical Relations among the Components of Social Action" in his Theory of Collective Behavior (New York: The Free Press of Glencoe, 1963), pp. 32-46. See in the same volume his application of the "value-added" concept from economic analysis to the description of sequential processes leading to collective outbursts. Ibid., pp. 13-14, p. 382 ff. Some of the infirmities of this mode of functionalist analysis are similar to those suggested below in the discussion of simulation modeling, pp. 37-44. On the other hand, the various metaphors of system, function, and closure in this theoretical orientation provide powerful conceptual tools for taking a total view of complex society, in the absence of fully adequate models for describing contemporary society and its processes. Without such a total view, any attempt to think about complex interactions of institutional processes in America fragments into a welter of unrelated concepts and unmanageable domains of data.

Of course, there are other conceptual orientations toward the social system, one of which Bohlen, Beal, Klonglan, and Tait apply to the civil defense setting in their study of community power actors and civil defense. They write (emphases in original):

> The local civil defense director needs an analytical model or framework to analyze and understand the relation of the local civil defense organization to its social environment. Two models are presented in the report which may serve as tools for the civil defense change agent (especially the local civil defense director) to analyze the social environment. The models may serve as tools which are vital to the initiation and implementation of new community programs by change agents.
>
> The social system model provides a framework which the change agent may use to analyze the community and its component elements. A social system is composed of the patterned interaction of members. The elements of the social system include (1) belief (knowledge); (2) sentiment; (3) end, goal, or objective; (4) norm; (5) status-role (position); (6) rank; (7) sanction; (8) facility; and (9) power. The structure and value orientation of a system at a given time can be described in terms of these elements.

social system becomes the target of weapons effects, it is through the obliteration or change of individual acts that patterns of social structure receive their primary interdiction. The first damage to the many levels of patterning of behavior in social structure comes when individual patterns of behavior are broken.

As a network of behaviors, the social system forms its own hierarchy of determinants for individual behavior. Individual behavior in society is constantly ordered as a result of the opportunities and constraints provided by this hierarchy. In addition to the complex behavioral entity formed by the social system, however, there is another level of behavioral organization to which actors can be seen to respond, as individuals or as participants in a social structure. This level provides the continuing body of values, symbolic meanings, techniques for symbolic manipulation (especially language and lexical devices), and generalized perceptions of not only the existential but the desirable which characterizes the total society. This body of values, perceptions, symbolic capacities, and their concrete manifestations in the real artifacts used in the transactions of social life forms the cultural system of the society. As a behavioral entity known by being abstracted from patterns of action and action-products displayed by individuals and groups, the culture of the society guides ongoing behavior, by providing a body of values and techniques against which past acts can be evaluated, present acts can be

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(Footnote 23, concluded) Joe M. Bohlen, George M. Beal, Gerald E. Klonglan, and John L. Tait, Community Power Actors and Civil Defense: A Summary of the Final Report (Ames, Iowa: Iowa Agricultural and Home Economics Experiment Station, Sociological Studies in Civil Defense, Rural Sociology Report No. 40S, 1965), p. 2. It should be noted that this body of concepts is especially useful for statically describing concrete systems of action at a local level, but that when applied to the task of describing institutional structure at the level of the whole society, it may prove to be only a discussion of institutional components and not of total institutions and their functional relations.

guided and structured, and future behavior drawn from a broad range of basic human capacities.[24] Metaphorically speaking, the cultural system provides the "institutionalized memory" of a society.

As a behavioral entity constructed analytically, the cultural system will seem to be the farthest removed from the kinds of physical, manipulable evidence with which analysts of attack effects work most confidently. As behavioral entities, however, both the social system and the cultural system of a society are analytic constructions based on determination of characteristic patterns of behavior produced by individual human actors. With the cultural system, the analysis has moved farthest away from simple summations of individual behavior into empirically observed patterns of social structure, and closest to the formal establishment of abstract systems of symbol, thought, and belief which exhibit

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[24] This general definition of "culture" derives especially from the perspective of the "social" or "cultural" anthropologist. While the material artifacts of a society form a "material culture" of enormous importance for describing and interpreting the distinctive patterns of that society, the present emphasis on the value and cognitive components of the culture enables a clearer address to considering the ways in which determinants of human behavior may be interdicted by attack. Given the focus on behavioral determinants, the problem of the loss of non-organic, material items from the material culture of a society can be best treated as a special case or sub-species of the problem of economic vulnerability.

It will be clear, also, that this focus upon values and cognitive elements in defining "cultural system" necessarily assigns several functions to value perceptions and value statements in the specification of institutional complexes to guide human behavior. This approach draws extensively upon the discussion of the normative and existential functions of values and value orientations to be found in Clyde Kluckhohn et al., "Values and Value Orientations in the Theory of Action", in Parsons and Shils (eds.), op. cit., pp. 388-433. To assign "functions" to value statements does not necessarily mean, however, that the analyst must see all individual human actors as rationally or consciously guiding all their acts of behavior with reference to formalized, carefully worked out, consciously studied systems of value. Value systems within the cultural system of a society must be studied at a level of analytic generality beyond the unit acts of individuals: These systems translate into human acts through such complex intervening levels as ideological systems, modes for attaining particular knowledge about the world (e.g.: the scientific method of inquiry and its procedures), and the normal, daily modes for implanting and enforcing standards of behavior. Admittedly, a discussion of the "functions" of values --- or, indeed, of any other analytically describable component of the structure of a society --- may open the analyst to

rules of procedure and intellectual manipulation independent of the characteristics of their users. Thus, the intellectual disciplines found in systems of logic, science, and laws for the governance of men can have their own existence as bodies of concept and rule. Nevertheless, as social patterns and social institutions, these disciplines exist within a cultural system which has its particular functional placements within the total institutional realm of a society.[25]

Here a new order of question opens: What is the "institutional realm" of society? It is one thing to determine in a rough way that a distinctive category of behavioral entity targets exists. It is a more complex analytic task to determine characteristics of these entities with sufficient precision to permit understanding of the structures and processes which will shape determinants of post-attack individual and group responses, when these behavioral entities have been subjected to attack. The present distinction between organic entity targets and behavioral entity

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(Footnote 24, continued) the danger of using models or metaphors which imply an excessive degree of conscious purpose in the guidance of institutional processes or individual behaviors. On these and related problems of functionalist analysis, see Robert K. Merton, "Manifest and Latent Functions", Ch. 1, of Social Theory and Social Structure (rev. ed: Glencoe, Ill.: The Free Press, 1957), pp. 19-84.

[25] The proposition contained in this sentence is one of the special preoccupations of the social science specialty known as the "sociology of knowledge". See Karl Mannheim, Ideology and Utopia: An Introduction to the Sociology of Knowledge (New York: Harcourt, Brace & Co., Inc., 1953); Karl Mannheim, Essays on Sociology and Social Psychology, ed. Paul Kecskemeti (New York: Oxford University Press, 1953); Werner Stark, The Sociology of Knowledge (Glencoe, Ill.: The Free Press, 1958); Edgar Zilsel, "The Sociological Roots of Science", American Journal of Sociology, XLVII, 4 (January, 1942), pp. 544-562. On the emergence and role of intellectuals as mediators of ideas, see, for example, Karl Mannheim, "The Problem of the Intelligentsia: An Enquiry into Its Past and Present Role", in Karl Mannheim, Essays on the Sociology of Culture, ed. Ernest Manheim and Paul Kecskemeti (London: Routledge & Kegan Paul, Ltd., 1956), pp. 91-170; Florian Znaniecki, The Social Role of the Man of Knowledge (New York: Columbia University Press, 1940); and Winston White, Beyond Conformity (New York: The Free Press of Glencoe, 1961).

targets, which is summarized in Figure I-1 (p. 36), enables the analyst to avoid some of the misleading directions that might be taken if "relationships, rights, beliefs and so on" were lumped together as "abstractions".[26] Beginning with observable acts of individual behavior, the analyst can infer the existence of four broad categories of system which become targets of attack. The crucial distinction which divides this group into two categories acknowledges that organic unity, relationship with physical environment, and emitted behavior are all physical traits of individuals, from the point of view of the perceiver. At the same time, "relationships" (elements of the social system) or "rights" and "beliefs" (elements of the cultural system) require inferences about patterns of behavior, whereas descriptions of organic individuals or ecological systems require categorizing of discrete unities or groups of unities.

Thus, when a society is attacked, it becomes vulnerable through effects exerted against both organic and behavioral entities. "Entities" is, however, only a shorthand expression for a myriad of individuals, groups, structures, and processes composed of sequences of acts. To understand the ways in which particular effects translate into vulnerabilities of the society, it is necessary to go several more steps and to begin by exploring ways for conceiving the dimensions of these entities. What does it mean, then, to speak of the social system and the cultural system as sub-species within a category of behavioral entities? What are the features of the social system and the cultural system which permit attack effects to be translated into "vulnerabilities" shaping individual behavior and affecting the ability of the whole society to respond to attack?

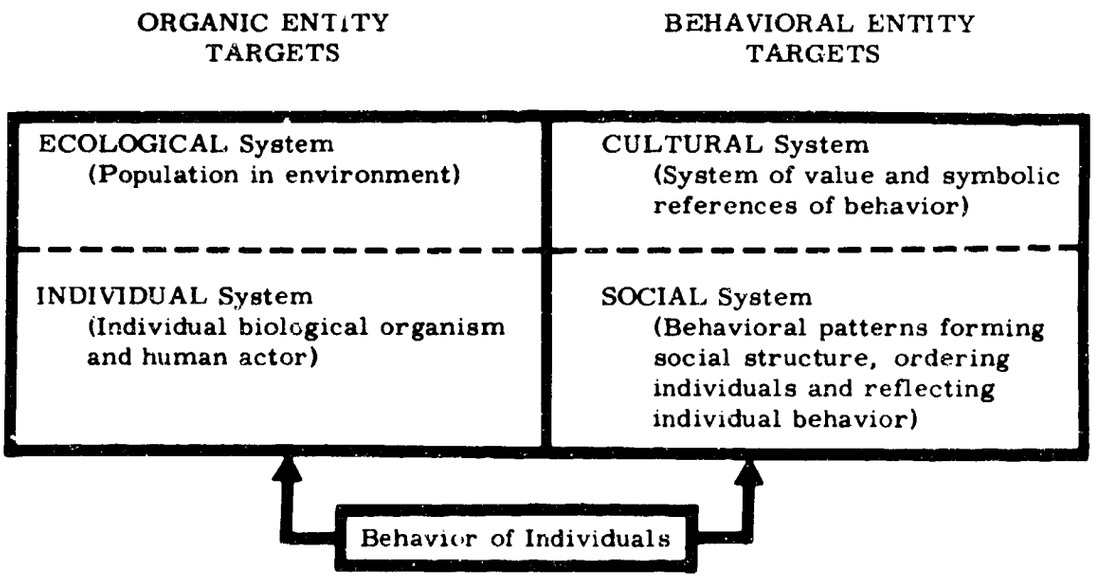
The main thrust of the remainder of this chapter and volume is that these questions depend for their answers, in part, on the examination of a range of behavioral determinants intermediate to the individual at one extreme and the whole social structure, ecological system, or culture at the other extreme. It will be argued that this intermediate range is peculiarly the domain of the analysis of institutional structure. Through institutions at several levels, individuals are organized into the patterns of society. When institutions change or collapse, a

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[26] Devaney, op. cit.

Figure I-1

OBSERVABLE SYSTEMS OF A SOCIETY,
AS TARGETS OF ATTACK



crucial intermediate domain of behavioral determinants alters. In principle, such an attempt to describe changing patterns of institutional structure and behavioral determinants requires an address to many unresolved contemporary problems in the theory of social structure and social change. Ultimately, the problem is nothing less than describing the interactions among the many levels and across the many institutional forms through which an ongoing society is organized and through which individual behavior patterns exhibit coherence and direction --- and then introducing a sudden, massive change agent in the form of a thermonuclear attack.

Before suggesting a working solution to treating problems of such scope, it will be helpful to consider very briefly several of the more important analytic techniques which might be employed. A look at these techniques will suggest some of the persistent problems of describing society and predicting interactions among the determinants of societal and individual response to an attack. Repeatedly, it will be seen that solutions to practical problems of predicting response to thermonuclear attack can go no farther than the capacities allowed by presently available conceptual techniques for analytically defining and manipulating the crucial traits of pre-attack society.

Simulation, and the Problem of Validity. In order to describe and predict all the important interactions of behavioral determinants and social responses following thermonuclear attack, it would be necessary to have a complete and closed model of the society. Such a model would be complete, in the sense that it would include all relevant determinants and determine all subsequent processes. It would be closed, in the sense that the relationships established among the various determinants and processes would accurately mirror the actual relationships of society and reflect all significant possible relationships that might occur. With perfect closure, such a model would exhaust the range of contingencies of social structure and process that might occur in the society. Moreover, it would reliably predict future configurations, given specified changes in the present.

Most generally, a model is a representation of the real world or some part of it. More specifically, in the present context it is frequently an abstract,

conceptual system designed to describe selected aspects of the real world and, with the introduction of appropriate information into the concepts and relations of the model, to predict future states of reality. It would be a staggering theoretical and practical undertaking to construct a working model of United States society for the purpose of describing and analytically manipulating all determinants of social responses to thermonuclear attack. Alone, the mathematical representation of interactions among various institutional sectors of United States society should open immense problems of permutation and combination.[27]

While a complete, closed model of American institutional process would present many problems of construction and operational manipulation, its principle must remain a major goal of any effort to achieve an exhaustive description and interplay of determinants of post-attack social responses. Indicators of the characteristics as well as the problems inherent in such a hypothetical model are to be found in some of the simulation models presently being constructed by social

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[27]The description of "input-output" relations among sectors of the economy --- an institutional sub-system of the total society --- has occupied a school of contemporary economists, and from such efforts may come clues to describing interactions within and among other institutional sectors. On some possible analytic relations between the economy and other sectors of the social system as it can be most generally defined, see Parsons and Smelser, op. cit. The most significant attempt to develop a model for examining relationships among post-attack capacities and requirements of economic sub-sectors is the PARM System (Program Analysis for Resource Management). This model includes a capability for examining a number of crucial input-output relationships in the economy. The system is described briefly in John De Witt Norton and Philip M. Ritz, PARM System Manual, Volume III, Section A: The Prototype Model Adaptation (Washington: National Planning Association Economic Programming Center, June, 1965). Norton and Ritz specify that given the conditions governing the design and use of the model, ". . . an open model is necessary. The choices open to the decision-maker are functions of the model design. Since the decision-maker's role is explicit, the open ends can be more numerous and less tidy than otherwise". Ibid., p. III-A2.17. Also see Joseph D. Coker, "Gaming the Post-Attack Economy", in Martin W. Brossman (ed.), Proceedings: Fourth Symposium on War Gaming, East Coast War Games Council (McLean, Va.: Research Analysis Corporation, 1965), pp. 43-48. Massell and Winter outline some of the information problems in assessing post-attack damage preparatory to economic analysis and decision. B. F. Massell and S. G. Winter, Jr., Postattack Damage Assessment: A Conceptual Analysis (Santa Monica, Calif.: The RAND Corporation, RM-2844-PR, November, 1961).

scientists.[28] As "the construction and manipulation of an operating model of a behaving system or process"[29], simulation modeling often seeks to produce an analytic, manipulable simplification of central features of systems or processes, to enable the analyst to explore characteristics of both these central features and the events over time which result from the interplay of these features. In dealing with such complex social phenomena as the performances of military strategists, negotiations among rival groups, or relations among nations, simulation modeling often offers the analyst the opportunity to work with complex group and institutional processes which are not otherwise accessible to empirical study.

Inevitably, the feature of simulation model construction which makes it most attractive for studying complex social process also contains its greatest weakness. To model social processes in a temporal dimension[30], it is necessary, first, to provide adequate conceptual representations of the components of the process. Frequently, this depends not only upon devising clear-cut analytic entities to represent the components, but also assuming the feasibility of systematic interaction among these components over time. Underlying this assumption of systematic interaction is frequently a "system metaphor", not unlike the widely

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[28] For example, see Harold Guetzkow (ed.), Simulation in Social Science: Readings (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962) and Harold Guetzkow et al., Simulation in International Relations: Developments in Research and Teaching (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963). For some present military applications of simulation techniques, see the papers in Brossman (ed.), op. cit. The TEMPER Model under development by Raytheon seeks to model Cold War conflict in a simulation utilizing data describing 117 real world nations. Raytheon Company, TEMPER, Volume I: Orientation Manual (Bedford, Mass.: Raytheon Company, "Prepared under the direction of the National Military Command System Support Center for the Joint War Games Agency", FR-65-174-1, July, 1965).

[29] Guetzkow (ed.), Simulation in Social Science, op. cit., p. 190.

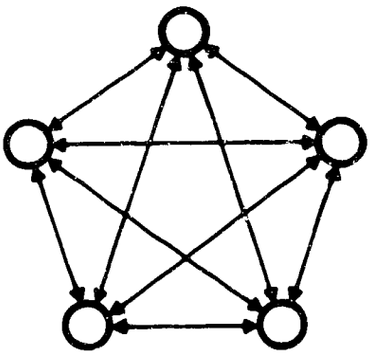
[30] This temporal dimension can be either in scaled-down or scaled-up intervals --- "simulated time" --- or in "real time", the time of the actual events being simulated.

pervasive system metaphor used in physiological research and one school of functionalist social theory.[31] This metaphor, which is given schematic representation in Figure I-2a (p. 41), pictures social reality as a constellation of interacting components, so placed in reciprocal dependence that a change in one component will be communicated to the other components of the system and result in complementary changes in the other components. Any attempt to model the interactions among the group processes and institutions of complex industrial society will find it convenient to assume some version of the system metaphor, as the attempt is made to grapple analytically with the complex social structures and processes which produce reciprocal patterns of event and effect in society.

Some of the powers of a simulation using a modified system metaphor are suggested in Figure I-2b (p. 41). This figure is a schematic, temporal projection of a simple model of communication and negotiation processes among three entities (A, B, C), which could be small groups, institutional sectors of complex social structure, or nations. Each group entity has a primitive form of internal differentiation (into sub-units a_1, a_2; b_1, b_2; c_1, c_2), which represent the internal units of the group which must interact in managing the external relations of the overall group. The vertical arrows connecting the overall groups depict flows of information and influence; as can be seen, each entity can communicate with and/or exert influence on each of the other entities. With the three groups placed in this system of interrelations, the analyst can study a variety of problems. For example, he may wish to determine what are the effects upon developing patterns of relations among the groups --- conceived here, perhaps, as national states --- when each group is given a somewhat different picture of the capacities and intentions of the other groups, within a context set by each group's own defining characteristics. This information is introduced at a first interval in the study, Time t_1. Figure I-2b depicts a possible sequence of events following the introduction of this information at Time t_1. At the start of a particular "game" at

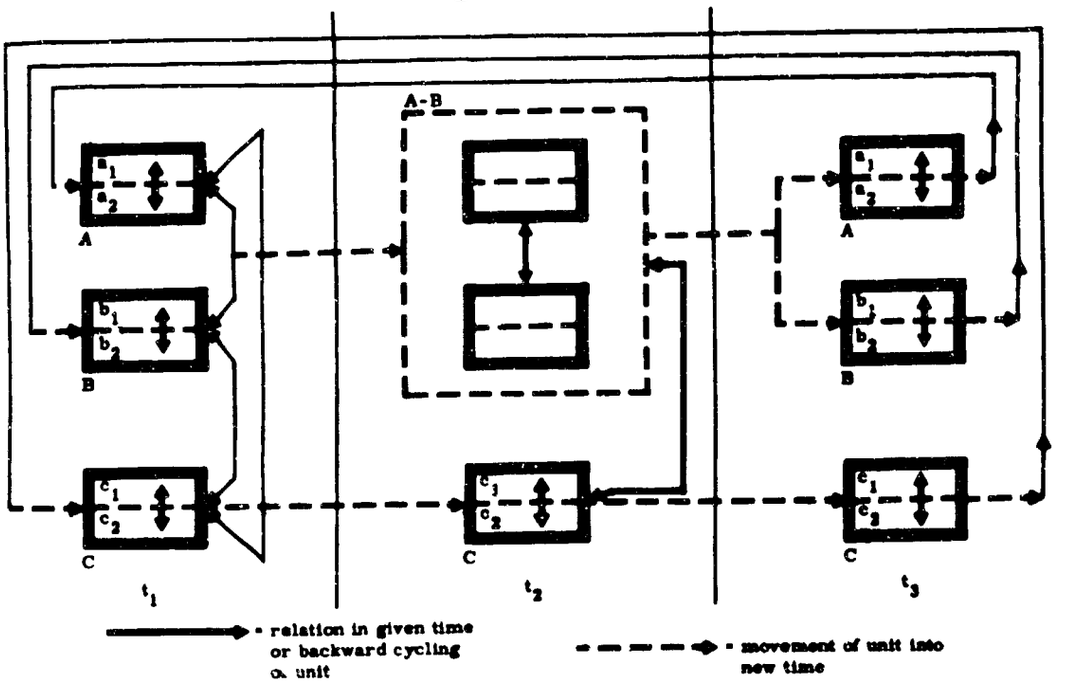
[31] For an extensively elaborated treatment of this metaphor in social theory, see Parsons, The Social System, op. cit.

Figure I-2a



SCHEMATIC DRAWING OF A SIMPLIFIED CLOSED SYSTEM,
SHOWING COMPLETE INTERDEPENDENCY OF COMPONENTS

Figure I-2b



SCHEMATIC DRAWING OF A HYPOTHETICAL SIMULATION MODEL
OF COALITION FORMATION, WITH SERVO CAPACITY FOR REPLAY

t_1, individuals acting on behalf of each of the three groups are required to act in such a way as to maximize the long-term interest of the group which they represent.[32] In theory, with the appropriate definition of each group entity and appropriate introduction of relevant information and operating rules, a variety of complex bargaining situations among various orders of social entity represented by A, B, and C could be studied. Individual players of the game, acting as decision-makers for their group-entity, could produce inter-group patterns and structures analogous to patterns produced in social reality by many more decision-makers acting within institutional settings of much greater complexity.

In Figure I-2b, the "game" has resulted at Time t_2 in the development of a new structural feature in the relations among the three group-entities. A and B, on the basis of communication and negotiation, have formed an alliance which, from the point of view of decision-makers in C, causes A and B to behave as one unit. Thus, relations between A and B and between A-B and C are now controlled by the dynamics of coalition bargaining and structure. This game and its outcome might offer several orders of insight to the social scientist. The student of inter-institutional process within complex society might wish to determine in what senses he could let A stand for the "economy", B for the formally organized national government, and C for the network of voluntary associations, "pressure groups", and individual commitments associated with democratic pluralism.[33] Under what conditions, then, would decision-makers in the economy and the governmental polity form arrangements which would not be responsive to pressures exerted from the "voluntary sector" of the society? What counterbalancing pressures could the voluntary sector exert to force the economic and political structures of

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[32] The present example is assumed to employ a relatively primitive level of mechanical techniques and is essentially an "all-man" simulation, as contrasted with a "man-machine" simulation or an "all-machine" simulation.

[33] Obviously, to carry this particular use much farther, it would be necessary to give much more complex internal differentiation of structure to A, B, and C.

the society away from alliances which might lead to totalitarian patterns? The student of international relations might wish to let each group-entity stand for a nation. The problem could then be to study analogues of the development and deterioration of international coalitions. Such analytic simplifications can be used to manipulate variables associated with the stability or instability of coalitions: For example, if Nation C were given appropriate information and the possibility of access, under what conditions might it seek to influence the internal processes of A and B? Could Nation C evoke conflicts between and among a_1-a_2 and b_1-b_2, conflicts which had been dampened by the formation of the coalition between A and B?

Coalitions can be broken, and at Time t_3 in Figure I-2b, A and B no longer act effectively in concert against C. The game based on this model of intergroup relations is now ready for recycling, which may take into account the coalition that existed at Time t_2 or may begin with a fresh set of players and informational items.[34]

While Figure I-2a, b does not reflect the richness of structural and situational differentiation available in some present simulation models, it does depict the central constraint upon those who would use simulation models for describing the constellations of behavioral determinants in complex society and for adapting this description to the prediction of events and changes after thermonuclear attack. In return for clarity in describing the elements of a society and the means through which they may influence each other during processes of social change, the analyst has had to adopt models and metaphors which may not include all the necessary information about complex reality. In some cases, it may not be possible even in principle to be sure what would be the characteristics of "all the necessary information". Is a coalition model appropriate to a three-person group an accurate --- valid --- description for the fundamental influence processes

[34] Games studying coalition formation have drawn extensively on the results of small group researches. A stimulating source of ideas and hypotheses on three-member coalitions is Kurt Wolff's rendering of Georg Simmel's classic propositions about the triad, in Kurt H. Wolff (ed. and trans.), The Sociology of Georg Simmel (Glencoe, Ill.: The Free Press, 1950), pp. 145-169.

exerted among three nations or three sectors of a society? How can the analyst specify the limitations to his conclusions about the working of complex social processes in a complex social order, when these conclusions are based on analytically complete, closed-system models which may be only limited abstractions from reality?

It would appear that a fully developed simulation of social processes might be the optimum solution to the problem of generating information about a variety of post-attack social worlds. In principle, such a model should generate specific predictions of known certainty, from an economically stated but comprehensive and systematically closed depiction of all relevant social institutions and processes. Clearly, the development of such a "social model" would require many intermediate orders of study and modeling. But even knowledge of the general requirements of such a model would assist social scientists in arraying the deficiencies in their present attempts to describe social institutions and social changes. For the present, however, the clarity and completeness purchased with a simulation model or a total model of society are purchased at the price of introducing several orders of uncertainty about the validity of these models.[35]

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[35] Seeking applications to the TEMPER Model (cf. Footnote 28 above, p. 39), Crow and Noël studied the following basic question: What is the validity of attributing to nations the behavior of individuals and groups participating in simulations? Wayman J. Crow and Robert C. Noël, The Valid Use of Simulation Results (La Jolla, Calif.: Western Behavioral Sciences Institute, June, 1965), p. 2.

Even with a hypothetically perfect model of society, the policy-maker would still be faced with the dilemmas of applying value criteria to the social outcomes projected by the model. At present, the policy-maker has an even more difficult situation. As W. W. Rostow, economist and then Chairman of the U. S. Department of State Policy Planning Council, noted before the Fifth World Congress of Sociology,

> ... the policymaker is faced with an extremely high order of complexity because of the number of variables he must take into account; ... since we lack any fully integrated science covering all these variables, the number of unknowns will always be greater than the number of equations. The responsible politician must solve his equations in part by instinct or by what might appear to a scientist as rather crude "common sense".

Propositional Inventories, and the Problems of Hierarchical Ordering and Closure. In the quest for knowledge about post-attack behavioral determinants and their interactions, there is an approach which contrasts markedly with model building. Yet, to call the development of bodies of propositions a distinctive "approach" may be misleading, for in all fields of scientific inquiry, a necessary condition for thought is to put both existing and possible knowledge in the form of coherent statements. These statements depend ultimately upon several syntactic modes for relating their elements. Such statements --- propositions --- assert various forms of relations between the "known" and the "known" or between the "known" and the "unknown". At their most rigorous, these statements assert their relations with specifiable degrees of certainty; in addition, their format permits the study of systematic interrelations among the assertions. Any orderly field of inquiry will reflect a preoccupation with ways of making assertions about the characteristics of the specific domains of reality of major concern to workers in that field. Whether the field is mathematics, sociology, biology, economics, physics, or poetry, its students will attempt to construct orderly statements --- frequently in the form of sentences --- which declare what they know.

(Footnote 35, continued) Put another way, a policymaker may resist a social scientist's vocabulary not merely because he may not understand it --- or because he finds it odd --- but because he may sense correctly that, if he accepts the going scientific vocabulary, he may be accepting a definition of his problem which will automatically screen out variables that ought to remain a relevant part of his consideration.

W. W. Rostow, "The Policymaker's View of Transitional Societies" (Address before Fifth World Congress of Sociology, Washington, D. C., September 6, 1962), U. S. Department of State Bulletin, September 24, 1962, pp. 452-453. Illustrating his observation with a discussion of societies undergoing rapid transition, he proposed "that it is a wholly different task to define conditions of tolerable stability in an inherently dynamic situation that it is to delineate a pattern of integration or equilibrium". Ibid., p. 454.

Most generally, a proposition is a sentence containing an asserted relation between a subject and a predicate. The subject is a discriminable aspect of a domain of reality --- a "thing"; the predicate can be a quality, or an element, or a past, present, or future condition of that thing.[36] A proposition is formed

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[36] This can be only a cursory discussion of the nature of a proposition; this treatment of the nature of a proposition is especially oriented to the particular purposes at hand.

The desire to codify social science findings in propositional form has been a strong impulse among those who have had a concern to apply the "findings" of the social sciences to matters of policy. Systematic organizing of knowledge has always been a necessary key to its use. In an inquiry into the meaning of the basic concepts of political sicence, Lasswell and Kaplan distinguish the manipulative from the contemplative standpoint in forming the propositions of their field:

> From the manipulative standpoint, the problematic situation with which inquiry begins is resolved into alternative goals possible in the situation, and the problem is formulated in terms of courses of action leading to the goal. The elements of the situation are analyzed and appraised in terms of their bearing on the formation of policy. The result of inquiry is a warranted statement of the way in which the actor in the situation can increase the probability of occurrence of a specified state of affairs: "To produce Y (or: To make Y most likely to occur), do X!"
>
> The contemplative standpoint is not concerned with the isolation of goal variables, and discovery of the operations required for them to assume specified magnitudes. Rather, relations of interdependence are formulated in terms of their significance for the ongoing of inquiry itself. Here, propositions state the existence of functional co-relations (in the form Y is a function of X). It is evident that these formulations may be translated into those of the manipulative standpoint, and conversely: one must do X to produce Y if and only if Y is a function of X.

Harold D. Lasswell and Abraham Kaplan, Power and Society: A Framework for Political Inquiry (New Haven: Yale University Press, 1950), pp. xi-xii (emphases in original). In developing bodies of propositions to apply to policy, it is insufficient merely to establish the formal characteristics of propositions as statements about reality; needed also is a canon for translating these statements of knowledge into policy. The canon may be simply a matter of setting up the rule, "Do X whenever Y is a function of X and Y is desirable". It may be difficult to "do X" in a direct sense, however, and the task of creating desirable outcomes may then involve not only rules for many intermediate decisions about what is known and what is desirable, but acceptance of approximations instead of attainments of desirable end states.

when a subject and predicate are linked by a relational form, which establishes the extent, kind, and time of the dependencies which exist between the subject and the predicate.

The expressions in Figure I-3 illustrate some of the kinds of propositions which can be built from subjects, predicates, and forms for relating them.[37]

Figure I-3

SOME BASIC FORMS OF PROPOSITION

(a) $S = P$	Identity
(b) $S = p$	Predicate as attribute of S
(c) $S \supset P$	Implication
(d) $S \subset p$	S implied by existence of p
(e) H: $S \leftarrow P$ or p	Hypothesis: prediction of association
(f) Given A, B, ... n, $X \leftarrow Y$ or y, with a P of p.	Conditional prediction

Perhaps the simplest form of proposition is the identity (Figure I-3a), where the assertion is made that in all respects, subject corresponds to predicate. The identity is an elementary form for defining basic concepts as continuing, lawful relations (as in defining universal gravitational force (F) between two bodies in the universe, $F = \frac{kM_1M_2}{d^2}$) or for showing stable relationships among variables (as in the simple physical formula for average velocity, Average Velocity = $\frac{\text{Distance}}{\text{Time}}$). In practice, the identity is frequently the end result of a series of inductive-deductive steps, which specify the predicate's identity with subject with increasing clarity and parsimony. The identity may also be used to express the relation

[37] This discussion has been adapted for present purposes from current modes of symbolic notation.

between an attribute of a subject and the subject (Figure I-3b). Here, the assertion is that under continuing and specifiable conditions, the subject necessarily contains attribute p, among other possible attributes.

The assertion of identity is only one of many forms which can relate subject and predicate. Especially in the beginning stages of inquiry, the extent to which subject is equivalent to or equals predicate may not be clear. Perhaps all the analyst can say is that the existence of a subject (S) is associated with the existence of a predicate (P or p). It may not be known whether S is in all senses exactly the same as P or includes p. It may be the case instead, for example, that S and P or p belong to the same total set of phenomena, but that subject and predicate belong to discriminable sub-sets as well, each of which must be taken into account in order to define and manipulate subject and predicate. Thus, given the association of S and P or p, it may be possible to show only that the existence of S implies the existence of P or p, and then to move on to examine in more detail the relations between the classes of things to which subject and predicate belong. Such a study of the classes may reveal the extent to which S and P or p are special cases of more complex things or events. In the beginning of the analysis, however, the analyst may notice only that subject implies predicate (which may be totally or partially descriptive of the subject), as in Figure I-3c. He may also infer the existence of the subject from one of its attributes (Figure I-3d).

Scientific propositions depend upon a format in which the conditions of identity or implication between subject and predicate can be examined. Ultimately, an hypothesis is a prediction of relation between subject and predicate (which may exhaust all relevant attributes or be only a partial description or specification). In basic form (Figure I-3e), an hypothesis is closely related to an identity in form: Given S, P or p will result. Such an hypothesis is only a special case of a more general proposition which creates the rhythm of scientific inquiry. This general proposition is the conditional prediction (Figure I-3f). Its format relates subject (here expressed as X) and predicate (here expressed as Y), when specific conditions (A, B, on to the nth. condition) are known, and with a degree of certainty expressed as a probability (P) of known quantitative value (p). Under this format, at the start

of inquiry, given conditions must be specifiable, and the dependent variable (the predicate Y) must be measurable concurrently with changes in the independent variable (the subject X). At the start of inquiry, the conditional prediction is an hypothesis; at the close of testing the hypothesis, the conditional prediction is a limited proposition describing or projecting attributes of an aspect of reality.

The basic task of a descriptive science which aspires toward the explanation of phenomena is to develop an array of tested hypotheses which can stand as propositions expressed as conditional predictions. In practice, the certainty as well as the meaning and significance of such propositions may be subject to many ambiguities. In introducing their propositional inventory of "findings" in the behavioral sciences, Berelson and Steiner explain,

> It would be nice to be able to say that the specifications and criteria were all clearly laid out at the start and that it was simply a job of following them out. But that was not the case. Rather, we began with a general idea of what we wanted to achieve: a distillation of the literature of the behavioral sciences in order to communicate, with a minimum of misunderstanding, "what we really know" to nonspecialists. From then on, it was a matter of trial-and-error, of gradually clarifying what we meant by a "finding", determining the "right" level of generality, locating the boundaries of importance, deciding how much evidence was "enough", and so on. For example, we decided early on to dismiss speculation, impression, anecdotage, or insight as evidence, no matter how brilliant or stimulating, no matter how persuasive to us personally. Nor did we accept single case studies: we grant at the outset that any conceivable human behavior has in fact occurred, somewhere, sometime. We asked for something more, and we tried to be guided by what passes for evidence among the more highly reputed practitioners and journals in the several fields. At the margins, the decision as to whether a particular finding satisfied the criteria for inclusion was extremely difficult to make, perhaps impossible to make with full knowledge and consistency.[38]

Not only are the criteria for "finding" not fully determinate, but the extent to which the findings as a body exhaust the relevant and significant findings of the behavioral sciences is somewhat uncertain. As substantive categories under which

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[38] Bernard Berelson and Gary A. Steiner, Human Behavior: An Inventory of Scientific Findings (New York: Harcourt, Brace & World, Inc.), 1964, pp. 6-7.

Berelson and Steiner array specific groups of findings, they chose Behavioral Development; Perceiving; Learning and Thinking; Motivation; The Family; Face-to-Face Relations in Small Groups; Organizations; Institutions; Social Stratification; Ethnic Relations; Mass Communication; Opinions, Attitudes, and Beliefs; The Society; and Culture.[39] The progression among the categories is from the individual to the whole society, but no claim is made that these categories necessarily exhaust the domains for describing human behavior. Furthermore, each heading is broken into listings of propositions which follow roughly the institutional lines of the intellectual disciplines from which they derive. The categories provide taxonomies for placing the main general concerns and specific findings, but they were not meant to imply theories or sub-theories which would unite the phenomena of each category into a predictive system or relate that system to a larger theory predicting the relations among all domains of human behavior. Berelson and Steiner's definition of science directs them to the empirical definition and examination of conditional predictions about fragments of reality and toward the accumulation of particular bodies of propositions; the implication is that larger ambitions would have been premature for a contemporary inventory.[40]

The limited, subject-predicate format of the conditional prediction creates a special thrust toward specific and concrete empiricism and the examination of limited aspects of social reality. Some of the utilities and limitations inherent in an array of conditional predictions appear in a leading inventory of studies of

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[39] Ibid., pp. xix-xxiii.

[40] As characteristics of the ideal pursuit of science, Berelson and Steiner stipulate: "The procedures are public ... "; "The definitions are precise ... "; "The data-collecting is objective ... "; "The findings must be replicable ... "; "The approach is systematic and cumulative ...", "The purposes are explanation, understanding, and prediction ...". Ibid., pp. 16-17. They say also that "the outlook of the scientist is important. He assumes, first of all, that there is some order in nature --- otherwise, why seek for uniformities?" Ibid., p. 17. On the issue of a feasible general scope, see Ibid., Ch. 1, "Introduction", pp. 1-13, and Ch. 17, "Conclusion", pp. 659-667.

human behavior in disasters, Barton's Social Organization Under Stress.[41] Barton's principal purpose is to construct a series of propositions about the responses of social systems exposed to traditional disasters which inflict "sudden and violent changes in the physical environment threatening both life and property. At many points however we will draw comparisons with other types of collective stress situations, such as the impact of depression, industrial change, or urban decay, in order to clarify the effects of particular aspects of the disaster stress".[42] Barton's main data derive from a number of detailed studies of relatively localized natural disasters, involving particular communities or regions; through the application of more general descriptive and explanatory concepts and the development of a comparative framework, he establishes categories for systematically evaluating the meanings of events in individual disasters.[43] The divergences and shortcomings in the available data mean that Barton cannot develop a systematic body of propositions for all potentially significant arenas of community response to disaster, a problem of which Barton takes detailed account.[44] Nevertheless, in his middle chapters, Barton presents a number of important substantive propositions on individual, collective, and social system responses to disaster, arranged where possible according to temporal sequence.[45]

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[41] Allen H. Barton, Social Organization Under Stress: A Sociological Review of Disaster Studies (Washington: National Academy of Sciences-National Research Council, Publication 1032, Disaster Study Number 17 of the Disaster Research Group, 1963).

[42] Ibid., p. 17.

[43] For a general discussion of the comparative method of social analysis as it can be applied to the disaster situation in both natural and thermonuclear settings, see Chapter VI, below.

[44] See Barton, op. cit., e.g., pp. 193-199.

[45] Ibid., Ch. 2 - Ch. 5.

Perhaps the best example of Barton's technique of inventorying and relating findings on responses to community disaster is to be found in his fourth chapter, where he shapes a large body of findings into groups of propositions on the processes and structures of the supportive social relations which emerge in a community disaster.[46] His thirty-five propositions ("factors") form eight groups. Table I-4 (p. 53) lists these groups in their order of occurrence; for each group, the lead proposition (with its original number) is given immediately below Barton's group title. Barton's purpose is explicitly systematic, within the constraints imposed upon him:

> In presenting these propositions we have tried to go beyond simply listing them, to tie them together in a kind of system model. Most of the variables appear not just in one but in several propositions. Some of their relationships counterbalance others; some reinforce others; and some feed back to grow upon themselves in snowballing processes.
>
> The model could have been made considerably more complicated than it is by adding more variables; we have tried to include only the main factors involved in the community response to widespread suffering. It should be emphasized that each particular proposition represents a tendency, which may be balanced or reversed by the action of other relationships in the model. The possibility of such reversals and other indirect consequences is exactly what this type of system model is supposed to point out.
>
> The propositions are, needless to say, not all scientifically proven. Some are supported by observation in many cases; a few by statistical data from one or two communities; some are based on scanty impressions, but are included because they are thought to play an important part in the whole process of community response to suffering. It is particularly important to note their cultural and historical limitations: they have been derived from analysis of situations mainly within the United States, mainly within the last thirty years. We have tried to indicate some of the social and cultural conditions under which they hold, but many more such conditions need to be stated before the propositions can be thought of as applying to human societies in general.[47]

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[46] Ibid., pp. 123-166

[47] Ibid., pp. 132-133. The "system model" used here is primarily the series of imputed linkages among orders of phenomena; it is not fully a model in the sense discussed immediately above in this chapter (pp. 37-45).

Table I-4

FACTORS ASSOCIATED WITH CREATION OF ALTRUISTIC NORMS AND BEHAVIOR IN COMMUNITY DISASTER - FROM BARTON

(A) Factors Influencing Communication and Knowledge about Victim's Losses (p. 133) 1. The higher the proportion of victims and the average loss, the more communication and knowledge there will be about the losses suffered by the victims. (p. 134)
(B) Factors Influencing the Saliency of Victims as a Reference or Identification Group (p. 138) 8. When informal social connections are strong within a population, the sufferers are more likely to be salient as a reference or identification group. (p. 138)
(C) Factors Influencing Beliefs about Causes of the Victims' Suffering (p. 141) 13. Social randomness of impact influences beliefs about the causes of suffering. (p. 141)
(D) Factors Influencing Feelings of Deprivation (p. 144) 16. The greater the proportion of victims, and the greater the average loss, the higher the proportion who feel severely deprived. (p. 145)
(E) Factors Influencing the Proportion of Community Members Feeling Sympathy toward Victims (p. 146) 19. The more communication and knowledge there is about the losses suffered by the victims, the more people will feel sympathetic toward them. (p. 146)
(F) Factors Influencing Opportunities to Help Victims (p. 148) 23. The greater the informal social connectedness of the community, the higher will be the percentage of members with opportunities to help victims. (p. 148)
(G) Factors Influencing the Proportion of Community Members Feeling an Obligation to Help (p. 150) 26. Ideologies and values influence the proportion who hold a normative standard requiring the giving of help to the victims. (p. 150)
(H) Factors Influencing the Proportion who Perceive "Helping the Victims" as a Community Norm (p. 153) 30. The greater the proportion who in fact hold a normative standard requiring help for the victims, the more people will perceive this as a community norm. (p. 153)

Source: Barton, Social Organization Under Stress.

Community response, reflected in the key "output variable" of percent of community helping the victims, is a result of interactions among a hierarchy of factors. Through this hierarchical specification, opportunities and pressures to help victims receive structure and direction result in concrete performances.[48]

As with so many other analytic techniques, in Barton's analysis, the virtues of his approach also imply its defects.

(1) Individual aggregate measures versus a community model. The best available and systematically manipulable evidence dictated that Barton see the emergent disaster response system and its output as the result of the increasing specification of individual behaviors in the aggregate.[49] Thus, the propositions

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[48] Ibid., p. 158, Figure 4-9. The preceding analysis assumes several complementary characterizations of individuals as members of collective units, in order to distinguish "community" from "individual" characteristics. Barton cites four types of characteristics of collective units:

> 1. Additive characteristics are simply derived by cumulating the characteristics of individual members of the collective unit in the form of a rate, a percentage, or an average.
>
> 2. Distributional characteristics emerge only when we look at the distribution of individual attributes for the entire collective unit: for example, the variance of individual losses, the social homogeneity the community, or the extent to which losses are correlated with high or low social status.
>
> 3. Relational pattern characteristics derive from the structure of pair-relationships within the collective. ... Liking and disliking, communicating, influencing, being related by family ties, or any form of relationship between two people can form the basis of a relational pattern for the collective unit.
>
> 4. Integral characteristics derive not from individual members, but from common objects pertaining to the community as a whole: its physical features, the content of its newspaper, the legal form of the local government.

Ibid., pp. 130-131 (emphases in original). In this framework, collective characteristics on several levels are reflected in the processes which produce the final community response --- percentage helping --- which is an additive characteristic of the community. Smelser cites a somewhat similar list in Chapter VI, below.

[49] This aggregate of behaviors is, of course, the result of processes describable at the several levels of community-collective characteristics.

or "factors" of Table I-4 are both empirical generalizations and predictions about the spread of potential responses to disaster by a responding population of individuals. The final output variable, "percent helping", is a measure of aggregated individual responses.[50]

Barton does not advance a model of the community as a system in its own right. Structural variables from community organization enter his propositions about individual responses (e.g., Table I-4, proposition 23). But these variables are introduced as separate independent variable inputs, without being cast into a fully developed framework for describing the community. Barton's community model remains implicit.

Since Barton's concern was to inventory factors mediating responses in a generalized community taken as the basic target of disaster, the problem of comparing communities can be analytically secondary to the primary problem of describing processes at work among individuals in communities. Where the target is a large group of communities or a whole social system, however, communities themselves may become the primary units of response from the point of view of those who must plan for the whole social system. Patterns of individual response in a community may be constrained by factors at the level of the social system which work outside the community and upon the community as a unit.

Insofar as Barton has produced an exhaustive, closed system of propositions, they are propositions about processes and structures of perception, communication, and influence among individuals within a community. The system depends for its closure upon describing the chains of communication and influence among individuals within a community who produce a potentially measurable aggregate of performances. This pattern of performances is itself only one element of a community response to disaster --- but it is relatively more easy to measure than such responses of the community structure as "organizational effectiveness" or "changes in power relations".

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[50] Under ideal circumstances, the characteristic method for determining the actual incidence of these responses would be a field survey of a population of individual respondents, leading to aggregate values on a range of possible responses.

(2) The generality of the hierarchical model. Within a limited domain, Barton's factors describing conditions of emergent helping and support are arranged in a hierarchy of determinants. That these propositions are seen by Barton as factors means that they do not necessarily exhaust even the determinants of helping responses by individuals. Not only may helping responses be influenced by factors in or outside the community which are not describable in terms of Barton's impact-perception-communication-influence-output paradigms, but these supportive responses may include other particular "factors" which do not emerge as propositions in Barton's present particular system. The propositional scheme permits the inventorying and statement of phenomena which are "factors"; the grouping of these factors permits Barton to arrange them in a hierarchical scheme of determinants which produces final results. But if this hierarchical model orders a limited domain of determinants, is it similar to other hierarchical patterns of determinants? Are there superordinate patterns of hierarchical determinants which can describe the response of the whole community and relate sectors of responses? It is impossible to answer such questions from Barton's "model", for his system is not a general model of behavioral specification in human institutions. Rather, it is the systematic interrelation of variables and conditions associated with a particular response. Barton's scheme appears relatively complete and hierarchically related precisely because it is the systematic interrelation of a series of substantive hypotheses about a limited sector of human responses to disaster, with measurement of a particular dependent variable as the final goal of measures and tests of the interrelation.

(3) Propositions and the problems of hierarchical ordering and closure. The great utility of the propositional inventory is that it enables the analyst to reduce an existing limited domain of information to sets of interrelated statements. As has been suggested in the discussion of Barton's work, however, the analyst pays his price. This price begins with the fact that he uses existing findings as building blocks. The inventory seeks to report systematically and to generalize what is known. In this systematic report, the inventory may employ analytic techniques which imply particular theoretical orientations and which use existing

concepts at several levels and ranges.[51] As a report of what is known, however, the inventory does not contain a method for projecting the unknown, except by treating the unknown as a domain of residual problems. By constructing upward from particular findings, the propositional inventory builds hierarchical interrelations among its propositions by reporting a particular domain and by then attempting to exhaust that domain. The hierarchy of relations and determinants may be exhaustive for a particular domain, but its place in even larger hierarchies which address the most general levels of behavioral description may remain obscure. Closely related to this narrowing of the scope of the hierarchical relations that can be established among propositions is the uncertainty about whether all importa t domains of phenomena have been hierarchically ordered. Would a complete, analytically closed description of all relevant social phenomena and their interrelations result if the possibilities for inventorying existing sectors of knowledge were fully exploited? How could the analyst know --- in principle --- if this would not be the case?

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[51] In his introduction to Barton's study, Robert K. Merton concludes with a discussion of an example of "how theorizing in the middle range" enables Barton and others "to work out a set of propositions that provisionally account for uniformities of behavior observed under conditions of disaster. These are propositions intermediate between a general theory of social systems, which is too remote from the facts of the case to account for what is observed, and mere description, which does not generalize at all. The question ... is this: 'Why do some situations of large-scale human suffering generate a high rate of supportive behavior toward the victims, while others do not?' (132). This is converted into the theoretical problem of the formation of social norms, in this special case, norms calling for altruistic behavior. Making use of a limited number of concepts and of empirical generalizations tentatively identified in sociological studies of disaster, Dr. Barton sets out thirty-five general propositions (134-162). These are more than a miscellany of ad hoc propositions, each unrelated to the rest; they comprise a set of logically related propositions in which any one can be derived from combinations of some of the others. The conceptual components of these propositions are drawn from accumulated sociological theory; the empirical referents have in varying degree been established by investigation. If this is a way-station on the road to more comprehensive theory, it is one which moves us ahead rather than requiring us to remain engrossed in debates over all-encompassing systems of sociological theory that have yet to guide us to determinate solutions of problems such as these". Barton, op. cit., pp. xxxv-xxxvi.

Moving from the study of communities and lower level social systems under natural or relatively limited disasters to the study of the whole society subjected to thermonuclear attack points up the limitations of the propositional inventory. While the model construction approach to describing possible determinants of post-attack social response was comprehensive, its validity remained in question. It was possible to conceive of a conceptual framework for addressing the whole social system --- but how could the validity of this description be established? With a propositional inventory of existing knowledge about elements of society, the question reverses. At present, there are sectors of the society about which the referents of propositions can be established with rigor and about which there are ranges of measures on significant analytic variables. But, in the absence of a tested total view or theory of the components of the whole social system and their interrelations, the significance of existing substantive knowledge remains uncertain. A substantive area of knowledge --- such as studies of collective behavior, production within and relations among economic sectors, or pressures toward consistency among cultural values --- may be definable and measurable as an area of carefully interrelated propositions. Without a total view of society, however, the interdependencies among one area and other areas of social phenomena remain only partially definable. As a result, any hierarchical ordering of phenomena must occur primarily with reference to phenomena at a level below the study of the whole society and the interconnections among its total institutional patterns. In one sense, this should be ideal, for the propositions will tend to be all about visible behavior within a sub-sector of society, from which inferences about larger scale social processes must derive. The lack of a total view of society means, though, that it will not be feasible to use these propositions about individual behavior as indicators of a full range of institutional processes and their interplay.

Thus, any ordering of propositions which is both hierarchically structured and, in principle, completely exhaustive of an actual sector of behavior will be limited in generality in the determination of events and, to an uncertain degree, narrowed in its specific reference. For its validity as a restatement of

particular domains of knowledge, a propositional inventory of the sectors of society surrenders a theoretical completeness in coverage and the ability to specify a hierarchy of determinants for many events which result from interplays among only partially definable institutional sectors.

A Compromise: Setting Ranges and Limits, and the Problems of Hierarchical Ordering, Closure, and Specification. The technique of simulation and social system modeling and the technique of propositional inventorying have contrasting, complementary virtues and liabilities in the study of possible social effects of thermonuclear attack. Attempts to model the total institutional structure of society would aid in tracing interactions among determinants of effects. Attempts to construct propositional inventories of what is known about human behavior under both stress and normal conditions begin in propositions about visible, individual behavior and work toward more abstract levels of both organic entity and behavioral entity attack effects. Yet, the forced closure and abstraction of present models raise questions about their validity, just as the substantive restriction of propositional inventories to particular domains raises questions about the degree of generality, systematic interrelation, and closure in any inventory. What can be done to combine the virtues of both approaches?

First, orders of knowledge do exist about the social behavior of individuals and about institutional components of society. Could these orders be combined into reasonably complete descriptions of the pre-attack states of various social sectors? Could specific values be assigned to the variables which describe states of the pre-attack society? Could a range of possible real values be assigned to variables and propositions describing social behavior and social actors, so that the possible real limits to ranges of the values and propositions could be ascertained for various projected conditions? How would these ranges and limits indicate the social dimensions of the principal responses to thermonuclear attack? For assessment of possible post-attack effects, an adequate description of social sectors requires propositions which can reflect a variety of values, under a variety of social conditions, along the significant dimensions which describe the sectors. The first goal in achieving such an adequate description would be, then,

to inventory existing concepts, variables, hypotheses, and propositions, in the attempt to achieve ordered, integrated descriptions of behavior in particular social sectors, and a statement of the conditions of variability of behavior in these sectors. By mapping out the range of possible behaviors and institutional responses within a given social sector, it would be possible to show the limits of any possible potential behavior or response. In this light, institutional-behavioral complexes set constraints on responses and form the referents of the analytic dimensions within which responses can be measured.

Second, some things are known about the "exchanges" which occur among various social sectors.[52] For example, the political sector of a society shapes the goals and decisions regarding allocation of resources which occur in the economic sector, even though the polity and the economy remain distinct institutional complexes. In turn, the polity supplies a framework of legitimacy and stability within which economic activity can take place. Various non-economic sectors (e.g., the value maintaining complex, including aspects of family, school, and religious institutions) shape the values which will determine, in part, how and whether workers enter certain sectors of the labor force in the economy. In turn, working forces supply material means for maintaining value-shaping institutions. In yet another "exchange", the basic answers achieved by a society to its functional problem of creating a self-maintaining ecological system of population-in-balance-with-environment will set limits to family structure and to the skill structures available for mobilization by an economy or polity. Enough may be known, in fact, to establish the tentative outlines of a systematic description which would relate --- on a fairly general level of conceptual abstraction --- the principal behavioral and institutional sectors which would determine responses to attack. Even so, however, the task of establishing the specific limits among the components would remain an enormous task, one which, if pursued fully, might conclude in the redefinition of the institutional sectors themselves.

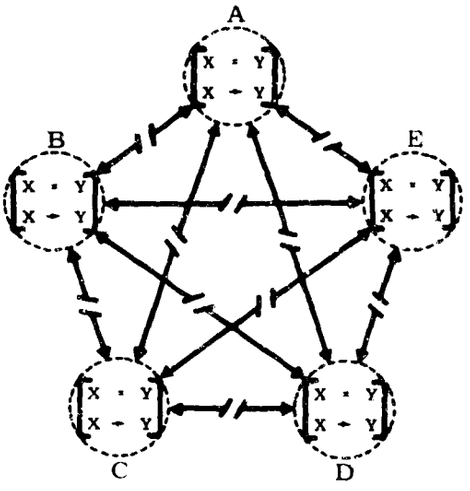
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[52] For a theoretical justification of the use of the concept of "exchange" in this context, see the lead references in Footnote 23, pp. 30-32 above, especially Parsons and Smelser, op. cit.

Figure I-4 provides a rough, schematic representation of some of the products of this analysis. The analysis begins with the ordering of data about social sectors (shown for convenience in Figure I-4 as being five in number). This ordering relates statements of defining variables (expressed for each sector as a group of identities, each of which can be stated in terms of an X and a Y) or tested propositions (expressed for each sector as a group of conditional predictions, each of which involves an X and a Y). Taken together, these propositions would define not only the normal relations within a social sector, but the ranges and limits of all possible behaviors and values of variables relevant to defining that sector.

Figure I-4

SCHEMATIC DRAWING OF EMERGENT PATTERN FORMED BY POTENTIALLY CLOSED SYSTEM OF INSTITUTIONAL SECTORS: SECTORS DESCRIBED THROUGH ORDERED BODIES OF PROPOSITIONS; LINKAGES AMONG SECTORS INDETERMINATE AT THE LEVEL OF WHOLE SECTORS



The analysis would then continue in the attempt to trace specific linkages --- expressed as propositions relating outcomes in one social sector to antecedents in another --- among the social sectors. Since, in the absence of full knowledge, it is possible to consider only specific linkages and not the whole pattern of

linkages among social sectors, the arrows connecting the social sector components of Figure I-4 must remain broken. These breaks signify the present impossibility of varying the total set of inputs and outputs between any two or any combination of social sectors, when each sector is taken as a totality. On the other hand, including these tentative relations in the Figure does indicate the existence of describable specific relations among elements and levels of the sectors. In sum, the Figure is meant only to suggest the ultimate goal of the analysis: a description of the total social system of society, utilizing systematically described social sector components and a form for interrelating these components which will permit the analysis of each component as a determinant of individual behavior or institutional responses, both within and outside that sector. Figure I-4 is a practical translation of the system metaphor in Figure I-2a (p. 41); taken as anything more than a way of schematizing relations crucial to the present analysis, it would be a parody of research objectives.

Figure I-4 also points up the purposes and problems of the studies which form Part II of this volume. The primary purpose of these studies is to set forth dimensions of present behavior and possible and likely future behavior of several key institutional sectors of society. The writers hold that these dimensions, and the resulting propositions expressed as substantive concepts, variables, and findings, will order the principal determinants of post-attack social effects. Because of the complexity of the areas considered --- demographic characteristics, the economy, collective social phenomena at many levels, and political values --- no writer can hope to sketch a full portrait of even the dimensions of his sector. Furthermore, no writer can develop a closed hierarchy of determinants of post-attack responses, although Chapter III (on the demographic issues of post-attack society) and Chapter IV (on dimensions and problems of the post-attack economy) come closest to specifying or suggesting the institutional constraints and values of key variables which are irreducible minimum conditions for post-attack institutional viability. As attempts to set ranges and limits to the characteristic subsectors of institutional groups and their potential effects on post-attack social responses, these studies are subject to the same problems of hierarchical ordering and closure which were described for less comprehensive propositional inventories.

What are the interrelations among the elements of an institutional sector, as described by a number of propositions about the dimensions and functioning of these elements? How can the analyst know he has achieved a complete, closed system for describing components and relations among components within a sector? Furthermore, insofar as he applies a system model to his own institutional sector, has he rendered a valid description of that sector? Just as the relations among the sectors shown in Figure I-4 must remain partially undetermined, so will the interdependencies within sectors remain only partially determined. The propositions, concepts, parameters, and variables describing each sector will not be fully interrelated.

In addition, the level of description required in these studies results in a special variant of the problem of closure. This problem may be called the "problem of specification". It arises when (a) an inventory is attempted of a theoretically incomplete domain of knowledge; (b) this inventory attempts to describe the principal structures and processes in social reality to which that domain of knowledge refers; and (c) the unresolved interactions and interdependencies among the variables and propositions make it impossible to assign clear and stable values and significances to the variables and propositions which define the "normal" states of real processes and structures. Thus, the key analytic problem in an inventory of knowledge about the domain is specifying within a limited, stable range the characteristics which define the key entities of that domain. Yet, without an overall view of the domain and the relations among its features, assigning values to those aspects where such an assignment is most feasible may create a misleading sense of having stated the key characteristics of this domain.[53]

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[53] On a relatively high level of analytic generality, consider the problems of stating and testing this proposition: In a political system, a relatively high degree of institutional pluralism is associated with democratic values. What is the operational meaning of the hypothesis contained in this statement? In what ways can an analysis of this proposition go beyond reification and ratification of an existing state of affairs? Under what specific, empirically testable conditions might institutional pluralism decline and democratic values be maintained? On a more specific level of institutional analysis: In what ways are religious organizations and labor unions definable, necessary variants from the American pattern of American voluntary associational life? For attempts to order the variables,

It is not enough to be able to define conceptual entities which have precise reference to empirically observable features of reality or to define the dimensions of their variances. To place these entities in relations with other entities of the domain and then manipulate them analytically, it will often be necessary to assign quantitatively and qualitatively significant content to them, and then to translate these conceptual entities to another level of analytic forms, involving at least approximations of hypotheses or conditional predictions.

Looking at an important case of institutional history for a general example, it is noteworthy that modern Western capitalism grew in those social classes and areas most subject to Protestant "worldly asceticism".[54] Such an association is not sufficient, however, to predict the specific rate of growth of capitalistic institutions, the specific forms these institutions took, or the features of modern economies which may institutionalize bureaucratic-organizational skills and values as contrasted with entrepreneurial skills and values.

Thus, the more comprehensive the inventory attempted of an institutional sector, the more difficult may be the problems in specifying values and characteristics of its components, the values and characteristics of linkage processes among components, and the hierarchies of "cause" and "effect" which guide institutional processes. Figure I-4 suggests some present dilemmas and present hopes. The dilemmas begin in the need to build integrated descriptions of components of the social system through inventorying knowledge in conceptual and propositional form. As descriptions of ranges and limits of possible events, the resulting propositions and established relations among variables will lack full ordering and

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(Footnote 53, continued) hypotheses, and propositions implied in these types of questions, see Seymour M. Lipset, The First New Nation: The United States in Historical and Comparative Perspective (New York: Basic Books, 1963) and William Kornhauser, The Politics of Mass Society (Glencoe, Ill.: The Free Press, 1959).

[54] Max Weber, The Protestant Ethic and the Spirit of Capitalism, trans. by Talcott Parsons with foreward by R. H. Tawney (New York: Charles Scribner's Sons, 1952).

closure; furthermore, relations among the described institutional sectors will be only partially specifiable, and then only as specific exchanges among institutional sub-sectors or individual actors. Yet, the guiding metaphor of Figure I-4 --- the interdependent system of components --- reflects the need for a view of society as a total arena within which effects of thermonuclear attack will be expressed. The metaphor points toward the kind of basic system pattern that might unite the specific or fragmentary propositions about the ranges of institutional characteristics which are available at present.

Metaphor and Myth in the Study of Social Stress

Uncertainties from Metaphor. As the discussion has progressed to the present point, allusions to the metaphorical nature of certain key concepts have crept in with increasing frequency. It has been said, for example, that because the institutions of society cannot be expressed with full validity in terms of a "system" model, the system concept is partly model, partly metaphor. Similarly, although the hierarchical concept has not yet been fully developed in the discussion, enough has been said to evoke the image of a hierarchical ordering of determinants of behavior as possessing many of the characteristics of a ladder of successive rungs or a stairway of successive steps, each stage of which is the antecedent for reaching a later stage. If a concept does not precisely correspond to its referent, however, has it a proper place in scientific conceptual analysis? Does the use of concepts which are partly metaphorical subtly edge the discussion toward the potentially highly subjective allusions of poetry?

At certain stages of analysis, there may be a closer relation between scientific analysis and poetry than many analysts would comfortably admit. Certainly the scientifically oriented analyst would reject out of hand the suggestion that the following description of grass is "scientific":

> A child said What is the grass? fetching it to me with full hands,
> How could I answer the child? I do not know what it is any more than he.
>
> I guess it must be the flag of my disposition, out of hopeful green stuff woven.

Or I guess it is the handkerchief of the Lord,
A scented gift and remembrancer designedly dropt,
Bearing the owner's name someway in the corners, that we may
see and remark, and say Whose?

Or I guess the grass is itself a child, the produced babe of the
vegetation.

Or I guess it is a uniform hieroglyphic,
And it means, Sprouting alike in broad zones and narrow zones,
Growing among black folks as among white,
Kanuck, Tuckahoe, Congressman, Cuff, I give them the same,
I receive them the same.

And now it seems to me the beautiful uncut hair of graves.[55]

Yet, is this parade of metaphors untrue? Of course, the metaphors are untrue, if grass is to be limited in its description to the physical dimensions of green plant life. But even a scientist may see "grass" in a larger context of meanings.

MacLeish suggests the nature of the poetic use of the metaphoric tool:

> ... For what gives a metaphor its power is not, as some writers seem to imply, a mysterious virtue inherent in the name. What gives a metaphor its power is precisely the coupling of the images of which all metaphors are composed.
>
> But here again, ... , I must repeat that it is metaphor in poetry I am discussing. For metaphors, of course, exist outside of poetry. They are common animals found in every use of words, including --- particularly including --- ordinary conversation. The difference is that in ordinary conversation, and in most kinds of prose, metaphors are only half alive, and tend, like grey cats at night, to disappear into the verbiage. They become cliches. Indeed a surprising number of the most depressing cliches in the language are precisely half-dead metaphors. They have ceased to express a relationship. Which means, since a metaphor is a relationship, that they have ceased to express. We say that a ship plows the sea but all we communicate is a ship moving. There is no plow. No plowshare. Nothing but a ship. And eventually even the ship vanishes into its verb.

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[55] Walt Whitman, from "Song of Myself", in Leaves of Grass, selected and with introduction by Christopher Morley (New York: Doubleday, Doran, & Co., Inc., 1940), pp. 39-40.

> In poetry, on the other hand --- in a good poem --- a metaphor is always a relationship: "the application", as Aristotle puts it in the Poetics, "of an alien name by transference either from genus to species, or from species to species, or by analogy, that is, proportion". Or, to use the language of a modern dictionary, a metaphor is a figure of speech characterized by the transference of a name or descriptive term to some object to which it is not properly applicable. A carrying-over, in other words, of a name, applicable to one object, to another object to which it is not applicable: an "alien name": a name which becomes "alien" in the process of transference. There are always, that is to say, two objects, two "things", in any live metaphor, any metaphor live enough to be used in a good poem.[56]

In poetic metaphor, then, there is a subject-predicate relation, but the meaning of the relationship is in the fusion of the imagery of subject and predicate, so that a larger meaning derives from the total relation. When at the end of a sequence of metaphors "grass" becomes "the beautiful uncut hair of graves", the poet is pointing to more than the structural similarity of grass and hair. He is intimating that a life process continues from the grave and that life may, in some sense, be eternal --- if in no other place, at least in the feelings and yearnings of the beholder of the grass growing on the grave. The ability of a poet to seize experience lies in significant measure in his ability to see such relations and to evoke their overtone meanings. The act of perceiving and recording these relations is one of the ends of the poet's craft.

By contrast, the scientific user of metaphor treats the metaphor as a predicate through which he seeks to express or summarize properties of the subject. A characteristic use of metaphor is to describe or hypothesize the relations among subject properties, on the basis of these properties being perceived as analogous to relationships which are more easily discernible among the properties of the metaphor-predicate. Thus, by seeing society as analogous to a biological system, thought is led toward postulating interdependencies among the elements of society, and it becomes more easily possible to develop hypotheses

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[56] Archibald MacLeish, Poetry and Experience (Boston: Houghton Mifflin Co., 1961), pp. 81-82 (emphases in original).

about social institutions as maintained and shaped through complex groups and levels of exchange processes. Such uses of metaphor tend to wander toward poetry, however, when the analysis substitutes the metaphor-predicate for the subject and, by asserting the analogy between metaphor-predicate and subject, implies that mere recognition of the relation constitutes explanation of properties of the subject.[57]

Stabilizing the use of a scientific metaphor becomes a particularly subtle task when it is recognized that while phenomena and their effects may be identified on a general level, the concepts satisfactory for identification and description on that level may be inadequate as tools for further analysis on a more specific level. The adequate definition of one of the basic concepts of this volume, "social stress", is an excellent case in point. In Barton's usage,

> Disaster is part of the larger category of collective stress situations. We shall define a collective stress as a large unfavorable change in the inputs of some social system.
>
> The term social system can be applied to collectivities ranging from enduring small groups, like a family, all the way up to national societies or a world social system. ...
>
> The inputs of a social system include its physical environment, its external economic relationships, its external power relationships, and its sources of personnel. The physical environment may change for the worse through floods, storms, explosions, droughts, plagues, and the like. Economic inputs may fail due to loss of markets or suppliers, or through breakdown in the system of exchange. External power relationships may become unfavorable through conquest, persecution, or the rise of competing powers. Recruitment of personnel may fail due to changes in the belief systems of the underlying population, the migration of the supporting population elsewhere, a

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[57] This discussion emphasizes the functions of metaphor in helping the analyst untangle the complexities of the subject, through the perception that the content of the metaphor-predicate is analogous to the content of the subject. Therefore, the discussion in this paragraph speaks of "metaphors" as units or as elements of a relation. In the logical exercise of assigning qualities to things as well as in the perceiving of relations among things, however, metaphor and analogy are both forms of relation. The differing relations implied by analogy and metaphor are assessed against the requirements of concepts for social theory in Irving Sosensky, "The Problem of Quality in Relation to Some Issues in Social Change", in George K. Zollschan and Walter Hirsch (eds.), Explorations in Social Change (Boston Houghton Mifflin Co., 1964), pp. 17-60.

deficiency of births, or an excess of deaths. We distinguish these externally caused collective stresses from internal social conflicts; while these have some similar consequences, their origin, ongoing processes, and resolution are quite different. Attention in such cases focuses primarily on resolving the conflict.

Stress on a large system naturally affects the smaller units which make it up. A smaller unit can thus be studied under stress limited to that unit, or within the context of a much larger stress situation. ... Some things will be the same regardless of the larger context, and others will be different according to the total scope of the stress.[58]

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[58] Barton, op. cit., pp. 3-4 (emphases in original).

Some writers would include "stress" and "strain" among the basic processes that define any social system. Pursuing an analogy with a building, Bertrand asserts:

> The analogy of a newly erected building may be used to further illustrate the concept of stress-strain. Such a building would be subject to certain forces which would result in stresses and strains from the moment the first brick is laid. ...
>
> Likewise, a social system is subject to stresses and strains from the moment of its inception. A certain amount of stress and strain is inherent in the system and may be seen in conflicting or deviating behavior from the beginning, because as mentioned, its individual members have not been equally socialized or the specificity of roles is not clear. As a result, no member of a system defines or carries out his status-roles in exactly the same way other members expect. The important point, to emphasize, is that the discrepancy is at the structural rather than the behavioral level. Said another way, stresses and strains derive from adding one member after another to the social system until it is an ongoing whole just as in a building they derive from adding one brick (or other structural unit) to another unit until the structure is complete. In other words, the individuals or the bricks as independent and isolated units do not exert forces of stress and strain on one another which have functional implications. It is only when they become components of a structural whole (a system) that this phenomenon occurs. This is also the point at which social organization becomes manifest. ...

Alvin L. Bertrand, "The Stress-Strain Element of Social Systems: A Micro Theory of Conflict and Change", Social Forces, XLII, 1 (October, 1963), p. 5. Bertrand then goes on to define "stress-strain" as one of the fundamental elements of a model of a social system. It is perhaps unfortunate for Bertrand's larger theoretical view that by including "stress-strain" as an element, he is only

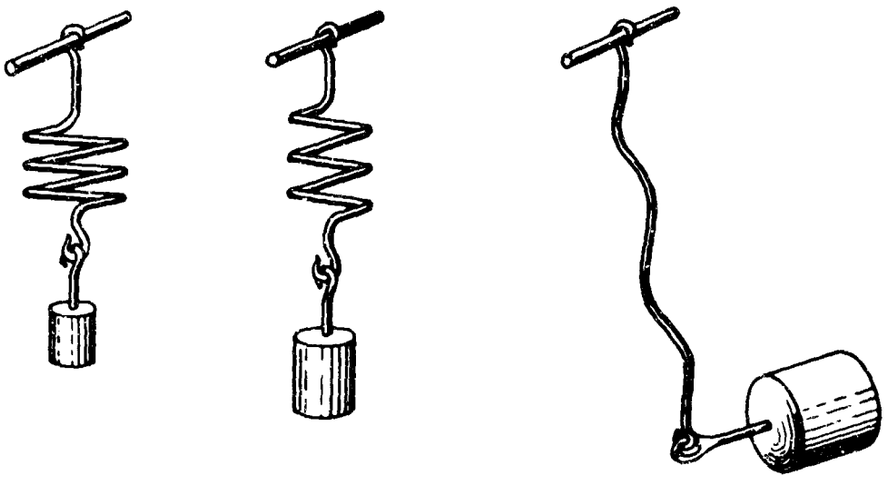
Barton carefully differentiates ways in which varying levels of social system may be affected by stress, and he notes differing sources of stress. Nevertheless, his unitary definition of "collective stress" as "a large unfavorable change" within a "system" is essentially the language of physical science translated to the social science setting.[59] The very term "stress", in the context of "system", implies a variable force acting with an outcome specifiable in terms of another unified variable. Figure I-5(p. 71) illustrates the precise meaning of the operation of the stress variable in physical science. In physics, a weight suspended from an anchored spring creates a measurable strain in the spring, so that the spring extends. As the weight (stress) is increased (in grams, pounds, ounces, or another measure), the strain on the spring increases in a regular relationship and the spring extends further. The limiting point in the relationship is the point at which the metal of the spring can no longer support the next increment in weight, at which point the conditions of the relationship between weight and spring change, and the spring loses its shape or snaps. The complexity of the elements of a social situation of stress and strain make it necessary to analyze the social system using many more variables and dimensions than in the simplest physical case, yet the most convenient terms for labeling the overall phenomenon --- "stress" and "strain" --- are most explicit in their meaning when applied to single variables.

(Footnote 58, continued) redefining the problem of predicting and specifying stress and strain. The problem still remains to determine which institutional structures and behaviors are most likely to be sectors of stress and strain in a social system, and why these particular sectors are more likely than other sectors. But, by defining stress and strain as inherent features of social systems at the most general level, Bertrand makes it difficult if not impossible in principle to specify forms of stress and strain as dependent variable outcomes of specific institutional processes. Although Bertrand asserts to the contrary (Ibid., p. 6), it would appear also that he comes close to losing the necessary distinction between stresses and strains that are "functional" for a social system and other stresses and strains that are "dysfunctional".

[59] Uses in this chapter of terms such as "component" reflect a similar translation. On problems of stabilizing the reference of convenient metaphors in social theory as it is applied to current civil defense controversies, see Vestermark, loc. cit. On the role of metaphors in behavioral science analysis, see Kurt W. Back, "The Game and the Myth as Two Languages of Social Science", Behavioral Science, VIII, 1 (January, 1963), pp. 66-71 and Harvey Nash, "The Role of Metaphor in Psychological Theory", Behavioral Science, VIII, 4 (October, 1963), pp. 336-345.

Figure I-5

A PHYSICAL SOURCE OF TWO SOCIAL METAPHORS



Hooke's Law: STRAIN is proportional to STRESS until the elastic limit has been exceeded.

In practice, Barton recognizes this issue as he arrays the many settings, processes, and forms of social stress, even though it is noteworthy that he leaves the issue at essentially this point. The metaphorical aspects of the term "social stress" or "collective stress" remain an important problem in the search for ways of defining and analyzing unprecedented social stresses. In what ways is it analytically possible and feasible to consider a massive attack with thermonuclear weapons on a complex industrial society? Is "stress" any longer a valid term, as a term for uniting descriptions of attack effects? Are new metaphors needed? If so, what metaphors? Will the legacy from the physical origins of the "stress" concept tend to set unconscious limits to attempts to work out a more differentiated concept of what happens when many levels of social structure are suddenly attacked through their organic and behavioral elements?

The less explicit a metaphor, the more the potentiality for being misled by it. "System" and "hierarchy" are relatively explicit metaphors; although "stress" is somewhat less explicit, its origins are still easily accessible. On the other hand, some metaphors which have guided perceptions and policies toward post-attack and disaster responses remain implicit and hidden. One of these is concealed within the "panic myth" or "pandemonium model": It may be termed the "primal jungle metaphor". As was noted earlier in this chapter,[60] a widely pervasive myth has been that a nuclear or non-nuclear catastrophe will cause wild panic among a suddenly struck population. For officials and lay personnel alike, this has been an uncritically accepted myth, which melds misperceptions and fantasies about past experiences with anxieties over future responses. For some analysts, the imagery of people in wild, fleeing pandemonium has been the ground for a "pandemonium model" of expected group responses in disaster. Panic or pandemonium models affect thinking about other than immediate post-disaster responses, however; it has been frequently held that civil defense shelter preparations in advance of attack or the use of shelters after an attack would result in a generalized, continuing pandemonium. For example, Klineberg asserts:

> To burrow beneath the ground for weeks, or even longer, means for human beings a denial of most of the values which have been acquired slowly and painfully in the process of creating a democratic society. Instead of community there is a splintering into isolated individuals or tiny groups. Instead of cooperation there is a violent competition for available space. Instead of mutual aid, there is a selfish struggle for individual survival.
>
> Psychiatrists speak of regression when adults behave in a manner appropriate to children. We may speak of social regression when a whole community behaves in a manner characteristic of primitive, archaic, even animal-like existence, almost to the point of re-creating a Hobbesian war of all against all.[61]

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[60] Cf. p. 6, above.

[61] Otto Klineberg, "Dangers of the Shelter Psychology", in A National Shelter Program: Its Feasibility and Its Cost --- A Report by a Group of Independent Specialists (New York: Privately printed by the authors, 1962), pp. 26-27. On themes of anxiety in the civil defense debate, see Vestermark, loc. cit.

In this passage, the primal jungle emerges clearly. The difficult-to-acquire values and discipline of democratic civilization will be shattered by the conditions of shelter use. As the savagery of the jungle once prevailed, so will it return.

Behind a number of the panic myths or pandemonium models lie the unstated imagery and metaphor of the reversion to the primal jungle. This metaphorical view of human origins is one of the elements supporting fears that men cannot adapt to unexpected and unprecedented stresses. If men's rationality and discipline are essentially precarious, then the shock of disaster will create panic and pandemonium in the short-term following the disaster event. If the urge to insure one's physical survival and comfort at the expense of all others remains a powerful latent urge, then the exigencies of living in a world of shelters will unleash drives toward social regression.

The uncritical acceptance of this metaphor, together with its manifest myths and models, can have specific effects on planning for coping with disaster --- just as some users of these metaphors, myths, and models intend. If a policy-maker, planner, administrator, or operator assumes that human values and discipline are relatively likely to collapse or "regress", his assumptions about human tolerances will be far different from the assumptions that would be held by those who believed that humans could tolerate the sudden onset and continuation of a high degree of stress, deprivation, and ambiguity. With these more pessimistic and anxious assumptions, a number of conclusions would follow. These conclusions can range from quite general assumptions about the human capacity for adaptive responses to disaster to quite particular decisions about the design of counter-measure systems. In the latter category are several potentially crucial decisions about how many people could be expected to remain for how long in a shelter system. If it is concluded that individuals, groups, and democratic values cannot tolerate long periods of living at very close quarters in a given system which is well designed to protect against direct physical effects of nuclear attack, then to preserve these human values, a vast increase in outlay of resources may be required to redesign

that system --- assuming that any survival of values is possible.[62] More space and more privacy will be required, more outlets for idiosyncratic needs must be permitted, a more elaborate and satisfying connection between shelter living and the valued social and political institutions of the larger society must be devised. An immediate conclusion would be that any frugal but physiologically safe shelter system must be redesigned.[63] Furthermore, the argument would necessarily continue, enormous outlays of material resources and organizational skill would be required, far beyond the anticipations of present-day planning.

One of the most vexing problems in using metaphor, then, is that insight it may afford into description and explanation of phenomena may imply a value position about the phenomena. One may perceive that in certain respects human society is at the end of an evolutionary path from the jungle; but, a jungle metaphor may be not only convincing as a description of what might happen again, but also a horrifying image, whose consequences are to be avoided.

As a result, the analysis stops, when, in fact, it may be just at its beginning. How is an individual who holds a version of the primal jungle metaphor and a corollary value commitment to democratic civilization to view the following discussion, where the writers assess relationships among variables associated with psychological and physiological adjustment in several historical cases of extreme overcrowding?

> The conditions of the Middle Passage or the convict transports, it would appear, reduced both oxygen consumption and heat production to levels far below what one would predict on the basis of calculations for such crowding in such well-insulated space using output values of normal metabolic activity.

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[62] Critics of shelter concepts frequently argue that in the end, no survival of valued institutions is possible after immersion in the shelter environment and that, as a consequence, particular discussions of design problems are sterile exercises at best.

[63] And, it could be argued further, even if a population did survive in the short run in a much more relevantly and adequately designed shelter system, there would be insufficient resources left after attack to permit the restoration of a viable and satisfying society. This is another issue, even though it is closely related to the present discussion. For a discussion of the economic aspects of this issue, see Chapter IV, below.

Such considerations actually qualify tremendously any optimistic conclusions one can draw about the extent of human tolerance for extreme degrees of crowding in conditions like those of sheltering following a nuclear attack. The latter circumstances would be more like those of our acute crowding disasters. The shelter-takers, presumably, would be in a highly excited state upon entering the shelter. They would not be acclimitized, as was the case of populations in our low-casualty, intense crowding episodes. Physiologically and psychically, they would be characterized by hyperactivity. The upward cycling contamination of the environment with outputs of CO_2, water vapor, and heat could be expected. Relative lassitude, such as was present from the outset of the voyage among the slaves and old prisoners, would not inhibit mutually destructive, violent activity among the shelterees. In many of the historical cases, large thermodynamic imbalance between the enclosure and its environment were produced by the metabolic activity of overcrowded persons. These imbalances increased rates of heat loss and air interchange with the surroundings . . . . Such interchanges, however, would be severely inhibited in those types of shelters designed or selected for maximum shielding from the atmosphere.

What browbeaten, shackled slaves and prisoners could take obviously provides no guide to what the contemporary American citizen could survive.

The above discussion should not be interpreted as suggesting that extreme oppression, subjection and dejection are sine qua non of surviving conditions of extreme overcrowding. It is possible, however, that such negative states of those affected are explanatory variables in a few of the most extreme of all the incidents surveyed. It is also useful to stress this kind of hypothesis for pointing-up the more general truth that there is no automatic correspondence between what is valued or valuable in ordinary circumstances and what may have survival advantages in extraordinary cases.[64]

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[64] Albert D. Biderman, Margot Louria, and Joan Bacchus, Historical Incidents of Extreme Overcrowding (Washington: Bureau of Social Science Research, Inc., BSSR 354-5, March, 1963), pp. 27-28 (emphasis added).

A recent study of "psycho-social problems of shelter occupancy" investigated ways of measuring "psychological environments" at the beginning of and after a period of confinement. G. H. Wright and W. O. Hambacher, Psycho-Social Problems of Shelter Occupancy (State College, Pa.: HRB-Singer, Inc., July, 1965). Although the investigators used a sample of mental hospital patients (N=33), they feel "the sample chosen to be used in the present study probably was more representative of the general population than volunteers" (Ibid., p. 53), because of their ability to draw upon a "near-normal" sample, the fact that many

Utilities of Metaphor. Metaphors or metaphorical techniques of thinking can be especially useful in the beginning of an inquiry into a complex subject, where levels of analysis may not be clear, where issues may appear to have contradictory implications, and where any kind of analogy or label may help to order an ambiguous domain. Among their many functions, metaphors can provide the beginnings of models for describing complex interactions among causes and effects. In the arena of policy discourse, metaphors may imply unifying principles to a range of choices available to a policy-maker and to the range of pressures for decision which he experiences.

In the arena of national security policy discourse, Kahn has recently shown the power of an organizing metaphor for making the complex relations among levels of international conflict more tractable to systematic study. His metaphor of the "escalation ladder" arrays stages of developing conflict, from the least stressful "crisis" situation to the most demanding general war situation.[65] By overtly

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(Footnote 64, continued) Americans spend time in mental hospitals for reasons other than overt psychosis, and because of the similarity of the mental hospital environment to the fallout shelter environment (Ibid., pp. 52-53). Their central methodological conclusions are (Ibid., p. 103):

> 1. Certain behaviors appear to be important in the psychological environments that exist (a) at the beginning of a period of confinement and (b) following a period of confinement.
>
> 2. The psychological environments that exist at the beginning of and following a period of confinement can be (a) defined, (b) measured, and (c) controlled.

An important theme of Wright and Hambacher's report is the potential feasibility of manipulating psychological variables to create greater capacities for individual adaptation to shelter confinement.

[65] Herman Kahn, On Escalation: Metaphors and Scenarios (New York: Frederick A. Praeger, 1965). In this book, Kahn provides a systematic statement of the "escalation" concept, which had become an important term in the informal vocabulary of national security analysts. Kahn is very explicit about the partially metaphorical nature of his usage:

> I would like to emphasize again, though, that escalation ladders are metaphorical tools that have been found useful in preliminary studies of escalation. No particular ladder should be considered as being a theory of international relations, although it may be a fragment of such a theory. Its utility derives partly from its

employing the escalation ladder as an organizing principle, Kahn suggests both the taxonomy and anatomy of crises: Crises can be systematically rank ordered in their severity and grouped by levels ("rungs") and across levels. At each level, the structure of a crisis or potential crisis can be related to the requirements and options of national security policy. By showing how crises may have differing levels and how one level translates into another level, Kahn not only shows how crises can grow in scope as a result of their own internal dynamics, but he enables the policy-maker to be more overtly aware of the pressures which can lead to "escalation". This offers important advantages to national decision-making. In cases where the national policy-maker does not have full control over the variables which combine to generate a crisis, systematic application of the escalation ladder metaphor nevertheless allows him more power to describe what is happening and to predict what may happen than would otherwise be the case. In those situations where the policy-maker does have relatively great control over the variables in a crisis --- particularly at the "lower end" of the escalation ladder --- his awareness of the relations among the "rungs" of an "escalation ladder" may better equip him to control, moderate, or orchestrate a particular crisis at a particular level of intensity.

(Footnote 65, continued) provision of a convenient list of some of the options available, and partly from its ordering of escalatory activities in a way that facilitates examination and discussion.

The escalation ladder also may be used to set a context for the discussion of escalations in terms of regions of the ladder, steps up and down the ladder, rungs of the ladder, and so forth. The ladder concept is particularly useful when one attempts to examine the interrelations between the two basic sets of elements in any escalation situation --- those related to a particular region on the ladder and those related to the dynamics of moving up and down the ladder.

Ibid., p. 38. See also the discussion of "Relevant Concepts and Language for the Discussion of Escalation", in the Appendix, pp. 275-300. For a discussion of uses of the "escalation" concept in various sectors of the national security policy dialogue, see Robert A. Levine, The Arms Debate (Cambridge: Harvard University Press, 1963), esp. pp. 73, 105, 109-110, 157, 167-170, 231-232.

The descriptive and summarizing power of metaphor in scientific inquiry can be illustrated by stepping outside the social sciences to look at a domain fully as complex as national security decision-making or predicting the social effects of nuclear attack. Over the past decade, several emergent metaphors have accompanied striking advances in molecular biology.

Through the study of the molecular structure of viruses, biologists and chemists are unfolding clues to the basic nature of the hereditary process in life. It has been shown that viruses consist of a structure of nucleic acid (RNA, ribonucleic acid; DNA, deoxyribonucleic acid) encased in protein.[66] Viruses reproduce by invading a host. While the metabolic processes of the host supply the materials and energy for new virus constituents,

> ... the blueprints describing the finished product, the virus, are supplied only by the invading viral nucleic acid. Thus the nucleic acid, RNA or DNA as the case may be, carries all the information necessary to make more of the viral nucleic acid, as well as of the one or several virus-specific proteins.[67]

The information is thought to be a resultant of the sequential ordering of basic structural groups along a series of "chains" in the complex molecules of nucleic acid. This ordering determines the sequence in which host components and processes can enter into the formation of new virus components. The structure of the nucleic acid functions as a code or body of information which governs the steps through which new virus bodies are created. In short, the nucleic acid contains a genetic code, the information which governs the transmission of traits from one organism to another and determines their traits as they reproduce. Through a study of the code and information functions of nucleic acid, a general paradigm for the processes of heredity in life has begun to emerge.

The contemporary revolution in genetics is based on a developing understanding of the structure of nucleic acid molecules, but the language most convenient for describing and summarizing the overall significance of the findings

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[66] This discussion is drawn from Heinz Fraenkel-Conrat, Design and Function at the Threshold of Life: The Viruses (New York: Academic Press Paperbacks, 1962).

[67] Ibid., p. 110 (emphasis added).

has been a language drawn from "information theory" in linguistics, psychology, and engineering. While "information" and "code" are commonly used to refer to systems of meanings, in mathematical or engineering theories of communication information need not refer to specific meanings or message content. Instead, information refers to the ability of a message, when properly utilized, to reduce a number of possible alternative choices confronting an individual human or non-human system of message-processing and symbol choice-selection.[68] This meaning of information was developed especially for use with systems of communication which had to reproduce elements of messages through complex circuits, regardless of particular message meanings. The problem of information was not the question of understanding meanings as such; rather, it was constructing systems which could select out and reproduce exactly whatever systems of symbol were put into the communication circuits.

It is "information" and "code" in this mathematical and engineering sense which appears to have provided the basis for the partially metaphorical translation of "information" and "code" to genetic studies on the molecular level. Nucleic acid carries "information" and "code" in the sense that its structure triggers and specifies an orderly sequence of reproduction of new nucleic acid structures. In this sense, "information" in nucleic acid specifies a series of "choices" of building blocks which become new viral structures in exactly the sense that "information" in a communications circuit specifies choices of message elements from a large range of potential message elements. Yet information contained in nucleic acid is information in a partially metaphorical sense. When the nucleic acid starts a sequence of reproduction, it produces a total structure and communicates traits to new entities. Insofar as these structures and traits have their own meanings as separately describable, analytic entities --- in, for example, a theory of heredity or organic structure --- they form a domain of meanings apart

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[68] The technical meaning and significance of this generalized, non-semantic definition of information are discussed in C. F. Shannon and W. Weaver, The Mathematical Theory of Communication (Urbana, Ill.: University of Illinois Press, 1949), esp. pp. 3-48, 95-117.

from the processes of their creation.[69] The information contained in nucleic acid not only specifies sequences of reproduction in the engineering sense, it represents the abilities for whole traits to be reproduced and to emerge. Therefore, it is information about traits --- in short, information as a system of meanings. As a result, the information and codes contained in nucleic acid structure represent at least in the metaphorical sense the ability to transmit meanings.

Through a complex metaphorical and engineering translation, then, viruses come to contain information and codes. To see viruses as having these properties makes it possible to see how total structures and total traits reproduce over generations of viruses. More generally, the information and code metaphors provide the scientist with the beginnings of a paradigm for considering the transmission of traits over generations of more complex organic systems. The paradigm originates partially in the analytic shorthand of the metaphors.

The second part of this chapter begins with an attempt to refine the "system" metaphor as a device for describing the elements of a society which will interact to shape the social effects of nuclear attack. The concept of system will be used as a tool for analysis, and an attempt will be made to restrict the ambiguities which afflict the use of partially metaphoric concepts in scientific analysis. The results of this analysis may be tentative and suggestive; their validity must be the subject of further research in general theories of social systems. In the absence of better tools and devices, however, partially metaphoric tools must be used. Their usage alone does not render the analysis "unscientific". As has been suggested, metaphor and insight from metaphor often must be a central tool in undertaking complex problems. On the other hand, science declines and poetry begins when metaphor becomes an end in itself, or when it becomes a device for

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[69] In an analogous way, the social system and cultural system exist apart from the behavioral items which form the basis for inferring their existence. See pp. 28-34, above.

deliberately creating and trafficking in ambiguity.[70]

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[70] On the techniques of metaphor in English verse, see William Empson, Seven Types of Ambiguity (New York: Meridian Books, 1957). The capacity for developing and institutionalizing a scientific mode of inquiry in a society depends crucially on attitudes taken toward ambiguity and the unexpected among the users of the society's symbolic culture. In a society with scientific institutions, periodic, fundamental reorientations toward real world phenomena occur when analysts are able to develop new general paradigms for viewing phenomena, after settled interpretations of these phenomena have resulted in ambiguities and anomalies. Scientific development will depend, in part, on whether scientific institutions can create the intellectual conditions for the reassessment of old paradigms and the creation of new paradigms to resolve these ambiguities and anomalies. A discussion of the history of the development of some new general paradigms for specific sectors of reality is given in Thomas S. Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1962).

The development of scientific institutions and modes of inquiry appears to be inhibited in cultures where ambiguity and metaphoric thinking have independent institutional status. Donald Levine, in a provocative discussion of metaphor and ambiguity in a dominant sector of Ethiopian culture, illustrates the techniques of the institutionalized capacity for ambiguity in communication found in the Amharic idiom of "the wax and the gold" (Sam-ennā warq):

> Sam-ennā warq ... consists of an explicit comparison in which the subjects being compared --- the wax and gold --- are presented in apposition, while their predicates are rendered jointly by a single verb which carries both a wax and a gold meaning. (This terminology is derived from the work of the goldsmith, who constructs a clay mold around a form created in wax and then, draining the wax, pours the molten gold into that form.) So, for example, if the poet's aim is to praise a hero like Emperor Menelik, he creates a wax model, like "the lion", in terms of whose actions the gold, Menelik, is depicted: "The lion Menelik crushed the wolf Italy".
>
> Keeping this dual imagery consistent throughout the stanza is a primary rule of wax-and-gold composition. A poet who mixes his metaphors is sometimes rebuked with the epithet "hermaphrodite". The following example presents an Amharic couplet which properly embodies the sam-ennā warq figure:
>
> Etsa balas balto addām kanfareshe
> Medhānē alam lebē tasaqala-leshe.
>
> Since Adam your lip did eat of that Tree
> The Savior my heart has been hung up for thee.

II. Knowledge about Possible Post-Attack Worlds

Institutional Dimensions of the Social System

Society, Social System, and Social Structure as Entities. The magnitudes of the upper ranges of presently feasible thermonuclear attacks mean that it is ultimately necessary to consider whole societies as potential targets of attack. Even with lower ranges of attack, however, "society" is a crucial analytic level for considering the determinants and components of post-attack responses. This is because the interplay among the determinants of particular behaviors and institutional responses will occur, in important senses, at the level of the whole society. Metaphors and models for the dimensions of response to nuclear attack will be judged, in part, by their efficacy in labeling and relating the elements of the whole society that are subject to attack.

(Footnote 70, continued) In this couplet the wax of Adam's sin and Christ's crucifixion in his behalf has been used as a form in which to pour a love message. A literal translation of the wax of the couplet is:

> Because Adam ate of the apple from the Tree of Knowledge
> The Savior of the World has been crucified for thee.

To savor the gold of the couplet fully, one must know that the verb meaning "was crucified", tasaqala, may also signify "is anxious to be near". So a literal translation of the gold would be:

> Because of your [tempting] lips
> My heart is anxious to be near thee.

Donald N. Levine, Wax and Gold: Tradition and Innovation in Ethiopian Culture (Chicago: University of Chicago Press, 1965), pp. 5-6. The technique of sam-ennā warq is a vehicle for deliberate imprecision and ambiguity in defining and communicating important meanings. Levine avers, "The ambiguity symbolized by the formula sam-ennā warq colors the entire fabric of traditional Amharic life It patterns the speech and outlook of every Amhara. When he talks, his words often carry double-entendre as a matter of course; when he listens, he is ever on the lookout for latent meanings and hidden motives. As one of my Ethiopian colleagues has said: 'Wax and gold is anything but a formula --- it is a way of life'". Ibid., pp. 8-9. The tensions between this traditionalized ambiguity and processes of modernization have significant consequences for the directions taken by cultural change in contemporary Ethiopia. Ibid., pp. 8-17.

A society is a self-maintaining human population in relative equilibrium with its physical environment, sharing a common cultural system for defining values, existential realities, and symbolic modes and inhabiting a geographical area which is recognized as being "legitimately" the territory of the population. The society endures over more than one generation, and its institutions provide for this intergenerational continuity and for the organization of social action among the members into stable patterns which meet the requirements for maintaining the population in the present generation.[71]

As defined here, a society could be a small, pre-literate tribe or a large nation-state with a complex, industrial form of social order. Both extremes of societal form share these basic characteristics. To define a society is immediately to wrestle with a question of levels and boundaries. Boundaries of societies do not always coincide with political boundaries. A nation-state can be a society in its own right and a member of an emergent super-national international society or community. Assimilated or unassimilated minority societies may exist within a nation-state, especially when a nation-state is composed of several cultures, one of which is dominant. In the "Balkanized Europe" of the recent past, minority cultures formed independent bases for social order in a number of countries, and

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[71] This definition of society is a generalized empirical description of societies as they exist; in itself, it is not necessarily even the beginning of a theoretical statement. Yet, to note that there are certain "requirements" to be met in maintaining a population opens the important theoretical issue of defining the necessary functions that must be performed in society. One of the more vexing problems in functionalist social theory is to maintain the separation between a description of observable societal characteristics and an explanation of structural development in society which seeks to pinpoint the necessary functional processes which are served by elements of the social structure. It is too easy to convert observable regularities among forms of social structure and society into the conclusion that these particular regularities are necessary forms for meeting necessary functions, and that these necessary functions are definable as they are manifested in particular forms. This becomes an exercise in tautology. For a seminal attempt to wrestle with these and related issues, see D. F. Aberle et al., "The Functional Prerequisites of a Society", Ethics, LX, 2 (January, 1950), pp. 100-111.

unstable national regimes resulted.[72] In the new nations of present Africa, political boundaries frequently cut across the boundaries of tribal societies.

The anthropologist's image of the small, self-contained, pre-literate tribal and clan society has provided important impetus to the view of society as a clearly demarcated, whole entity. The present concern, however, is with the vulnerabilities of complex industrial society. As do members of other societal forms, members of an industrial society inhabit a core, bounded geographic area which belongs legitimately to their sovereign and which provides the enduring geographic focus of the cultural traditions of their nation. Within this bounded, geographic area, they have, as a population, established two key forms of balanced relationship. One is a static or dynamic equilibrium with their physical environment, from which they draw physical resources for maintaining life or acquiring the wherewithal to maintain life. The second is governed, self-perpetuating social interaction, based on social institutions defined within a common culture.

The distinctive features of a complex, industrial form of society are to be found in its particular social institutions and particular culture.[73] Industrial

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[72] While Czechoslovakia, Yugoslavia, Rumania, and the remnants of the Austro-Hungarian Empire were the center of the classic Balkan factionalism in Europe, Western Europe has had its problems, as evidenced in the enduring Fleming-Walloon controversy which rends contemporary Belgium and in the dying remnants of Scottish and Welsh separatism in the United Kingdom. Among non-European complex societies, India provides the most striking example of a national state seeking to impose its sovereignty upon a welter of potentially independent societal groupings. In the Western Hemisphere, Quebec separatism of both benign and revolutionary forms attests to the persistence of the distinct poles around which Canadian national society is ordered.

[73] It should be emphasized that this discussion concerns some of the important characteristics of complex industrial society. A number of societies have shown great structural complexity, although they do not possess the characteristics of an industrial social order. The complex caste and linguistic organization of the Indian sub-continent provides one example of continuing importance, even though India is in transit toward an industrial social order. Another and contrasting case is to be found in the elaboration of complex administrative and political forms by several West African kingdoms before the era of European colonization.

societies have a relatively high degree of division of labor and specialization among various occupational and life roles. This division of labor is reflected in the structural differentiation and separation of institutional sectors such as the economy and the forms for allocating, legitimizing, and managing political power, which in less complex social orders remain assimilated to a kinship-family and religious institutional nexus. This division of labor is further reflected in institutional mechanisms for allocating rewards and status to roles in terms of a general framework of social stratification which tends to emphasize the values of achievement rather than ascribed and assumed prior rights. In the economy, systems of currency, abstract value, and abstract legal-financial relationships provide both a common language for rewarding especially occupational role performance and a mechanism for governing the movements of people from one role to another. In industrial society, social status and power are frequently closely associated with occupational role.[74] The value system in the culture of industrial society creates a pressure toward mobilizing workers for recruitment to jobs and occupations on the basis of job requirements; this will frequently assume the willingness and the ability of the worker to alter and subordinate personal styles of life and to sever connections with kinship patterns. The structure and values of industrial society create extensive opportunities for the geographical migration of workers. In the early phases of industrialization, this migration will tend to be from country to city. Later, this country-city migratory pattern is supplemented by migration among growing cities and urban areas.

The high degree of structural differentiation, the money economy and its capabilities for abstractly stating value, the written culture to which there is relatively open (although sometimes sharply competitive) access, the existence of social values which emphasize achievement and performance, and the necessary hiatuses in social integration and control which accompany rapid change and development are among the principal features of industrial society which are

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[74] This provides an interesting paradox in those societies where a managerial class can achieve enormous influence and power in bureaucracies or in the whole social system, without necessarily receiving correspondingly high remuneration.

conducive to social conflict and strain. If opportunities for social mobility are relatively large, or if new levels of aspiration seem realistic to individuals or groups which accept the culture of the industrial society, then strain and conflict can arise when movements or aspirations are thwarted. Furthermore, the pressure toward individual autonomy in an industrial society means that individuals or groups with "problems" --- for example, the ill, deviant, structurally unemployed, members of low status minorities --- can be "neglected", even when those more able to cope with living in industrial society see these groups as "problems". Increasingly, the arena for coping with the strains resulting from these and similar problems is in the highly evolved political system of the society. But here, ideologies formed in different ways from approximately the same cultural norms frequently allow competing approaches to dealing with strain or stating new programs for the people of the society. If the ideological division converts into a debate on the legitimacy of the existing political order, the society faces a profound crisis of organization. In the Anglo-Saxon societies, traditions of consensus and the institutionalized Common Law have provided important frameworks for resolving conflicts when the social structural conditions for political crisis are present.[75]

Somewhat paradoxically, the complex differentiation of industrial social structure creates potentialities for a high degree of both social integration and social strain. The efficiency and interdependence of economic and political institutions and their components permit relatively easy access to and mobilization of consumers and citizens. At the same time, the opportunity for the expression of a rich variety of competing preferences and attitudes and the formation of subgroups reflecting special needs means that the setting of economic preferences and political goals can be subject to strongly competing cross pressures.

This discussion of the defining features of industrial social structure must necessarily be truncated, and it cannot attend to the important differences

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[75] The roots of these traditions of consensus and Common Law go very deeply into English and American social history, as is suggested by the studies reported in George C. Homans, English Villagers of the Thirteenth Century (New York: Russell and Russell, 1960).

which exist among varieties of industrial social order.[76] Possibly enough has been said, however, to suggest the shift of analytic focus that is necessary in order to compare forms of society. This analytic shift is analogous to the shift from the study of individual behavior and organic entities to the study of inferred behavioral entities, which was outlined above and summarized in Figure I-1 (p. 36).[77] As in that discussion, here, too, the analysis begins with the concretely observable --- a visible society, formed from a collectivity of individuals arrayed in ecological and geographical space. But to compare societal forms, it is necessary to speak of forms of social order, which exist as patterns of structural differentiation within the society and among societies. To describe the structure of a society beyond its physical array in space, then, it is necessary to develop analytic categories which permit the inferring and manipulating of the patterns which order individual behavior at levels beyond individual actors and patterns of

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[76] As a topic in sociological analysis, the comparative study of types of complex industrial social order has produced a voluminous literature. For a general theoretical orientation to the analysis of industrial society, see the lead references in Footnote 23, pp. 30-32, above. On the development of institutional differentiation in the early Industrial Revolution, see Neil J. Smelser, Social Change in the Industrial Revolution: An Application of Theory to the British Cotton Industry, 1770-1840 (Chicago: University of Chicago Press, 1959). The defining characteristics of the industrial social order, with special attention to the meaning of institutional differentiation, are considered in Talcott Parsons, Structure and Process in Modern Societies (Glencoe, Ill.: The Free Press, 1960), esp. Ch. IV, "Some Principal Characteristics of Industrial Societies", pp. 132-168. Bendix provides an analysis of contrasting modes of organizing value commitments of workers and managers in several forms of industrial social order. He provides a detailed analysis of ideological and structural features of East European state-socialist economic and political organization, as contrasted with Western free enterprise forms. Reinhard Bendix, Work and Authority in Industry: Ideologies of Management in the Course of Industrialization (New York: John Wiley & Sons, Inc., 1956). For comparative data on a central feature of the industrial social order, see S. M. Lipset and R. Bendix, Social Mobility in Industrial Society (Berkeley: University of California Press, 1959). For a critique of some contemporary interpretations of industrial society, with a special eye toward confounding historical evidence, see Barrington Moore, Jr., Political Power and Social Theory (Cambridge: Harvard University Press, 1958).

[77] Cf. pp. 28-37, above.

action. The analysis shifts from the description and definition of society as a physical array of discrete individuals ordered in a population to the description and comparison of forms of social system.

Social system may refer to several levels of organized social structure. Most generally, a social system is an organized, continuing, bounded pattern of social interaction among individuals.[78] The emphasis of this definition is upon organized, pattern, and interaction. As an organized pattern of interactions, a social system may be the patterned interactions of a whole society. But, a social system can be many other kinds and levels of organized collectivity: a local community, a voluntary association, a formally organized bureaucratic hierarchy, a religious sect. The concept of "social system" can also refer to a level of phenomenon intermediate between the social system of an entire society and the more limited patterns of organized interaction in concrete collectivities. At this intermediate level, the "social system" can refer to the total sector of a society represented by the system of patterned interaction in the society. This sector of structured interaction is analytically separable from other sectors of the society which create conditions for interaction and which may be modified, in turn, by patterns of interaction within the social system.

Confusion can arise because the concept of "social system" is more generally applicable than the concept of "society". A society is the concrete array of a self-maintaining population of individuals; a social system is a pattern of continuing interactions among individuals, at several levels. Difficulty also arises when the term "social system" is applied to patterns of interaction beyond smaller collectivities. When a social system is a sector of a total society or is used as a term to denote the pattern of interactions in a whole society, it tends to lose its precisely descriptive reference and to become a partially metaphorical tool for examining and modeling attributes of the social system as a system.

As will be recalled, a system is a group of interacting components, so placed in reciprocal dependence that a change in one component will be communicated to the other components of the system and result in complementary changes

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[78] Parsons, The Social System, op. cit.

in the other components.[79] If it is noted that a system is self-maintaining, then it becomes plausible to ask whether this maintenance of system coherence is itself a result of system processes. If the interrelations among system components are crucial to this maintenance process, and if the components of the system are differentiated from each other by structure and quality, then it is plausible to see the different components as performing different functions in the system and for the system. To infer a pattern of interaction from individual behaviors and to perceive it as a social system is, then, to do more than describe an interrelated pattern of events. Partially metaphorically, it is to imply a translation of the basic system model to social interaction; it is to propose that elements of the social system can be discerned and that they perform functions in the total social system. The system model-metaphor becomes a tool for examining the functional differentiation of the social system, at its various levels.

The actual analysis of social systems begins in the analysis of social structure. If a social system is an organized, continuing, bounded pattern of social interactions, social structure is the organized pattern of positions and relationships which results from interaction. These social structural patterns are composed especially of social roles and patterns of intermediate social organization linking individuals in stable pathways for interaction; they can range from the level of primary, face-to-face groups (e.g., the family) to elaborate forms of secondary social structure, such as large bureaucracies, political entities, and, in certain respects, whole social strata. Like the concept of social system, social structure is an analytic construct drawn ultimately from acts of individual behavior. In contrast with the system concept, however, social structure is the essentially static pattern of relationships formed by ongoing interaction in a system, at a given cross-section through time. In considering the effects of thermonuclear attack upon society in general and upon behavioral determinants in particular, the initial address to attack effects beyond the individual level of behavior will be to attack effects expressed through damage to the social structure. By eliminating individual occupants of positions in a social structure and by otherwise eliminating

[79] Cf. pp. 39-41, above.

the necessary conditions for the functioning of these positions in a system of ongoing human relationships, the attack damages social structure. In damaging social structure, the attack damages social systems at various levels of complexity. By affecting the total constellation of interaction patterns which forms the total social system of a society, the attack "damages" the society.

Institutions and the Hierarchical Ordering of Behavioral Determinants. The concepts of "society", "social system", and "social structure" denote whole entities --- either aggregate populations or total interaction patterns. True, the concept of "system implies a model for differentiating these entities into components, but the problem remains of specifying the kinds of relationships these components might have. Without being able to specify these relationships and to say more precisely what are the features of the components that enter into these relationships, the effort to define societal vulnerability to thermonuclear attack effects must be restricted.

This is because the wholistic description of the entities that are attacked --- whether these entities be "society", "social system" or "social structure" --- forces the analyst to describe vulnerability of society in terms of a social damage assessment, which produces aggregate measures of individual human losses or gross estimates of effects which limit the functioning of social organization. While broad in its reference, "vulnerability" described in these terms must be described with reference to total patterns of loss. Interactions --- including both multiplications and cancellations of the effects of loss --- cannot be considered, for degree of vulnerability resulting from an attack is expressed as a function of total loss against a baseline, pre-attack description of society. The whole state of a society can be described, but it is impossible to explore variations in attack effects within the society, except as they are discernible correlates of gross variations in the aggregate measures taken on the whole society. This means that it is impossible to trace the specific patterns of attack effects which may form elements of the total vulnerability problem and to address these patterns of "processes conducive to vulnerability" on a level below that of the whole society. Without this differentiation of the vulnerability problem, "vulnerability" remains an attribute of the whole society.

The resulting notion of vulnerability is wholistic and therefore simplistic. More importantly, the practical consequence of this failure to differentiate the vulnerability concept is that vulnerability reduction systems must be designed with immediate reference to the whole society. Although attack effects may be expressed in important senses on the level of the whole society, politically and economically feasible vulnerability reduction measures must begin with more manageable concerns, in particular social sectors. In this instance, political and economic realities are reinforced by the limits of knowledge of how societies function and change as whole entities. A scientific as well as politic address to vulnerability reduction planning requires a concept of vulnerability which permits the analysis of the components of a state of vulnerability, both for pre-attack and post-attack society.

If a wholistic view were applied to the problem of estimating the vulnerability of a total society to attack effects, a gross demographic-ecological inventory - projection of the surviving population and its material resources would emerge he primary methodology for assessing the after-attack state of the whole society the resulting degree of societal vulnerability. Calculating degree of vulnerability would have two basic stages, each stage with a number of extremely complex tasks. First the analyst would calculate the total ratios of pre-attack population characteristics to post-attack population characteristics and pre-attack to post-attack degrees of environmental equilibrium which the population will have achieved. Secondly, he will apply these ratios to some prior notion of the critical ratios of before-after population characteristics and environmental balances required to maintain the distinctive, self-maintaining characteristics of the population. Degree of vulnerability of the total society becomes, therefore, degree to which post-attack population and ecological characteristics change the ratios toward the critical ratios required for the minimum maintenance of the total pattern of population characteristics. When the ratio of characteristics drops below this theoretically defined critical ratio, it can be said that vulnerability has increased to the point where the population is no longer a viable entity, in the sense that it can no longer maintain its critically defining pre-attack characteristics in proper proportion or in proper minimum quantity, and it can no longer maintain the necessary balances between population and environment. Obviously, a great many analytic, data, and

procedural inputs and steps would precede the point in the analysis where the total ratios could be estimated. Assuming that such steps could be taken --- a very difficult assumption to make --- the resulting definition of societal vulnerability as a function of population loss and ecological upset would conform roughly to the model outlined in Figure I-6. The key element in this calculation of degree of

Figure I-6

FINAL ELEMENTS OF A SIMPLE AGGREGATE MODEL
FOR DETERMINING POPULATION "VIABILITY"

Population is viable (i.e., self-maintaining) when:

$$\left(\frac{\text{Post-Attack Population Characteristics}}{\text{Pre-Attack Population Characteristics}}\right) \times \left(\frac{\text{Post-Attack Ecological Balance}}{\text{Pre-Attack Ecological Balance}}\right) > \left[\begin{array}{l}\underline{\text{Critical Ratio}}: \\ \left(\frac{\text{Post-Attack Pop. Characteristics}}{\text{Pre-Attack Pop. Characteristics}}\right) \\ \times \\ \underline{\text{Critical Ratio}}: \\ \left(\frac{\text{Post-Attack Ecological Balance}}{\text{Pre-Attack Ecological Balance}}\right)\end{array}\right]$$

vulnerability is an adequate pre-attack projection or post-attack census of population characteristics and the resources available to maintain this population.[80]

Similarly, a calculation of damage to the total social structure using aggregate counting techniques can depict total losses in categories of elements of social organization. Assuming the development of appropriate measurement techniques, "organization" here can be taken in its broadest sense, to include not

[80] On the post-attack demography of society, see the discussion by David M. Heer, in Chapter III, below. On the problems posed by the relations between surviving resources and requirements for the maintenance of the surviving population, see Sidney G. Winter, Jr.'s Chapter IV below, "Societal Recovery after Nuclear War: The Economic Dimensions".

only formal, goal-oriented organizations --- governmental and corporate business bureaucracies, and the like --- but also patterns of kinship and voluntary association which have sometimes broader but less clearcut functions.[81] Yet, even if such measurements were performed, as either pre-attack projections or post-attack rapid "damage assessments", it would be difficult at present to incorporate these findings into a model of the sequences of constraints and determinants of post-attack organizational and behavior processes which produce "social effects" of attack over time. Again, this is because attack may have variable consequences in differing sectors of the social structure, which may in their own right have differing consequences for determining total patterns of social behavior. Without means for considering possible internal differentiations of the social structure in systematic relation to each other --- including especially the extent to which one sector of social structure may be "dominant" over or determinant of events in another --- aggregate measures of total "social damage" can give only a census of losses to social structure, and not indices of the significance of these losses.

Clearly, the answer to this issue would be the construction of a total model of societal functioning. Equally clear is that such a model is beyond the scope of this volume or the present capabilities of the social sciences. Preparatory to the effort to construct such a model, the kinds of aggregate measures of characteristics which have just been mentioned would provide important indications of the ranges of

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[81] Greer and Winch have explored the problems of measuring patterns of kinship and voluntary organizational ties in American society, with the goal of considering the durability of these ties in performing certain functions for maintaining the integration and coherence of post-attack society. Their empirical findings and preliminary speculations on a conceptual scheme for analyzing these patterns of social organization in communities subject to thermonuclear attack effects are to be found in Scott A. Greer and Robert F. Winch, Kinship and Voluntary Organization in Post-Thermonuclear Attack Society: Some Exploratory Studies (McLean, Va.: Human Sciences Research, Inc., September, 1965). Their study included not only extensive conceptual analysis but also analysis of field survey materials on patterns of kinship and voluntary organization in a Chicago suburb and in the state of Wisconsin. They gave special attention to the physical area correlates of patterns of kinship and voluntary organization, as the basis for a potential methodology for translating immediate weapons effects into damage to social structure arrayed in physical space.

quantitative values of the social characteristics of the members of society. Of equal importance, however, must be the attempt to make the analytic jump between visible behavior of individuals on one level and the visible pattern of a self maintaining population in society on another level, and to show or suggest the processes which order the translation of individual behavior into society and social systems. Without showing how this translation from the individual to the societal is made, the analyst cannot understand the significance of aggregate measures of social characteristics as they change. He will not have the dimensions within which to manipulate these characteristics and with which to direct his thinking toward intervening variables, processes, and structures which may determine the ways in which these changes in these characteristics may be associated with changes in specific patterns of behavioral determinants. After all, the practical issue is to try to learn more about the causes and constraints of post-attack social responses and about how these causes and constraints can be manipulated to reduce social vulnerability to attack effects.

While a full model of behavioral determination in society cannot be constructed at present, it is possible to suggest more about the ways in which individual human behavior is structured into patterns of social interaction, and how these patterns of social interaction build into a total society. A beginning can be made by attending to the kinds of observable regularities of human behavior in society.

Within the total society and social structure, individuals participate in many patterns of behavior and interaction. For example, they form families; not only do families provide for human reproduction and training to the basic roles of society, but they are the primary nexus for the majority of consumer decisions in the economy. Individuals occupy roles of many types. A role is a coherent pattern of performances and attitudes characteristic of a particular position in social structure; it is the object of particular beliefs, values, and expectations by its occupant and on the part of those who interact with the occupant of the role. In the family, there may be both formal and informal roles. Beyond the instantly recognizable roles occupied by parents and children, there may be informal roles, of which the occupants may be only dimly aware. A child may play a buffer role in a family where there are two warring parents; the mother may be the provider of

material goods, while the father may provide the functional equivalents of feminine nurturance. Similarly, in formal organizations outside the family setting, there may be patterns of both formal and informal roles. The formal roles may be the sites of "legitimate" authority as well as of appropriate sets of skills, expectations, powers, and recognizable, valued performances. Yet, the informal roles may produce leadership structures which nullify the effects of formal roles of organizational leadership; labor-management disputes in factory settings will often remain irresolvable until the informal but highly effective role relations on each side come into effective interplay.

Beyond the primary social groupings --- of which the family is the type case --- and formal organizations with their many role possibilities, human behavior is subject to other kinds of constraint. All social roles exist in the framework of cultural values to which role occupants must attend in some way, sometimes only as they deviate from these values. Particular roles such as occupational roles are subject to more specific disciplines. For example, the monetary rewards for occupational role performance in industrial society are the specific means for workers to participate in a money economy. Reciprocally, the money economy provides a system of abstract value for differentially rewarding occupations within a common scheme. Among the professionalized occupations, formally or informally enforceable standards of quality provide yet another pressure toward specific kinds of value performances by members of the occupational stratum. Even in the formation of the primary groupings of society, patterns of standards guide the emergence of new primary units. Legitimate families are formed as the result of marriages, which lead to new family units and which join and extend pre-existing networks of kin. As entities, families and their members enjoy additional categories of legal rights which derive from marriage, itself a relationship established before the law.

Thus, patterns of established right, expectation, and power stand behind the formation of particular visible social groupings and patterns of behavior. Beyond these patterns of right, expectation, and power stand additional levels from which particular patterns of right, expectation and power derive. To have a legal, stable currency or a legal marriage, there must be law. This law must

be founded in a polity, of which wage earners and marriage partners are citizens. From this polity may derive additional patterns of right, expectation, and power necessary to its own maintenance. The polity must have the society's monopoly on the legitimate exercise of violence. Even under conditions of great social pluralism, the duly constituted agents of the national sovereignty inherent in the organized polity must be able to take steps to preserve the polity from external threats or internal collapse. In exercising its monopoly on the use of "legitimate" violence, the polity may require the obligations of military service, which create an important separate category of social organization and roles.

Pushing the analysis yet another stage farther --- acceptance of the demands of the polity on the citizenry will assume that the citizens have certain basic value commitments and views of the world. In a democratic society, the citizenry must agree that they can be bound individually by decisions made collectively or by their collective agents acting on their behalf, just as they believe that the sovereignty in the polity derives from the consent and the rights of each citizen. Such a view of the citizen in his state exalts the importance of the individual voice and implies a total view of what Man can mean.

This glancing look at some of the more important patternings of behavior in several types of industrial society underscores the fact that for many purposes, it is important to see human behavior as organized simultaneously on several levels. Furthermore, it underscores the striking interlinking of concrete patterns of social organization with particular complexes of value, attitude, perception, and belief. From a large potential repertory of human behaviors, selections are made. These selections form roles, primary groupings, and larger groupings of secondary social organization. Beyond these are even larger, less specific systems of regularity which are formed when people respond to constraints imposed upon them as a result of their having given their allegiance to general categories of behavioral requirements.

The total product of this selection and stabilization of behavior is social structure. The pattern of values, norms, attitudes, and constraints which governs the choice and stabilization of functionally significant social behavior in concrete

patterns of action is an institution.[82] The process of implanting this pattern of norms and constraints in society and in individuals so that specific action patterns result is the process of institutionalization. Viewed as an organized, integrated analytic entity, social structure is a network of institutions which prescribes and specifies stable, recurring, limited ranges of actual behavior and actual, interconnected social positions.

It will be seen that the term "institution" has a broad connotation in this usage. It is not synonymous with "organization" in the sense of a church, school, corporate business enterprise, military unit, hospital, or prison. These are all forms of social organization, which is a specific collectivity of individuals ordered toward the attainment of particular goals; as organizations, they are manifestations of institutions and institutional sectors in society. An institution forms a larger nexus than the particular organizations which may embody it. Thus, the economy of industrial society is an organized, complex institution, with systems for evaluating products and services, rules for mediating economic exchange relationships, and ordered, accepted patterns for accumulating and expending material and abstract wealth. All of these institutional patterns control the process of production and consumption. Specific occupational roles, corporate-bureaucratic forms of social organization, and monetary systems are the social structural dimensions of the institutionalized economy.

Religion is another institutional complex; for many members of society, it supplies crucial meanings for present living, by defining the nature of existence, the significance of the supernatural, the place of Man in the cosmos, and the concept of the right which must govern moral decisions and ethical [illegible]positions. Churches provide the principal structural dimensions for religious institutions in complex society.

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[82] "Functionally significant" here refers especially to the behaviors which can be shown to have some instrumental relation to the maintenance of society and its social structure. This view of functional significance is not meant to prejudge the question of "functional prerequisites" raised in Footnote 71, p. 83, above. To say that behavior has an instrumental relation to larger patterns of social process is not necessarily to say that this behavior is, in its particular form or as a general type, functionally "required" by society.

The polity is yet another institutional system. In complex society, rules must exist for allocating power in the name of the whole collectivity of citizens, and collective goals are set and implemented. Among the principal institutions within the institutional complex formed by the polity is the system of law, which, in the Anglo-Saxon tradition, applies an evolving body of principles and precedents to new case situations. Government, as both an arena for political dialogue and a formally organized hierarchy for administering political decisions, is a principal social structural translation of political institutions. In a democratic polity, the ongoing dialogue between citizens and representatives is a coequal structural manifestation of political institutions.

Institutional complexes may overlap. Marriage is an institution, of which the family is the social structural manifestation. But marriage is institutionalized through both the religious and political institutional sectors. In many religious institutional settings, marriage is a sacrament. In civil society, however, the agents of political institutions insist that marriage is a legal relationship. Therefore, the transaction of a particular wedding can be governed by the requirements of both religious and political institutions. Outside the family, education is the institutional sector which provides the principal formal orientation of the oncoming generation to the tasks of life. Its social structural-social organizational manifestation --- schools --- will generally be under the supervision of the polity, in recognition of the crucial functions of educational standards in maintaining the continuity and values of the society. At the same time, however, the immediate direction of schools may be vested in corporate bodies which are not part of a civil administration. Thus, beyond the system of public instruction there may be a "private sector" of schools and colleges. This private sector of social organization in education may have its organizational base in religious institutions, as in the case of parochial schools and church-related colleges, even though it receives civil chartering and accrediting. Here the base may combine and intermingle several institutional sectors. A noteworthy example of this fusion of institutional sectors occurred in the formation of several of the earliest Colonial American colleges, who resolved "not to leave an unlettered ministry", but who recognized

also that the ministers would form a central group among the literate men who would guide local community civic affairs.

That institutions have bases in value and value selections does not mean that they are analytic wisps. To the contrary --- particular, unified, coherent, continuing organizational and social structural manifestations in society express traceable, visible institutional patterns. The general significance of institutions is a more complex analytic issue, however, for the vital functions performed by institutional patterns in society press the analyst to conclude that there are a certain number of functional requirements in a society which must be met by a certain number of functional and functioning institutions. At this point, the kind of organizing model or metaphor of society available to the analyst becomes crucial in determining the extent to which institutions can be seen as both individually necessary and mutually interrelated. As this volume proceeds, this general question of the significance and relationships of institutions will be approached in several ways.

Regardless of the solution to these complex theoretical issues, the concept of "institution" provides a key reinterpretation of the meaning of societal vulnerability to thermonuclear attack. At a level between that of the whole society and the particular, isolated human actor, it is possible to distinguish an intermediate level of behavioral organization. A model of <u>society</u> would depend upon an exploration and understanding of this level; the prediction of <u>individual behavior</u> would depend upon specifying the determinants of behavior set at this level. This level is the level of institutions, from which derive particular patterns of social organization and larger, total patterns of social structure. Cast in terms of institutions, organization, and social structure, the fundamental questions about social vulnerability to thermonuclear attack become the following:

(1) In what ways can concrete patterns of social organization be damaged by thermonuclear attack?

(2) What are the analytic concepts and dimensions for expressing this damage?

(3) In what ways does this concrete damage to social organization and social structure, as measured by the appropriate analytic concepts and dimensions, indicate the weakening of institutional sectors of complex society?

(4) On the basis of particular damage to social organization and structure and inferred weakenings of institutional control, what conclusions can be reached about the kinds of behaviors which individuals, groups, and organizations will manifest in both the short run and longer run after attack?

(5) What will these expected behaviors and group responses indicate about the ability of members of a society to maintain the coherence of the society, set meaningful recovery goals from attack, and continue as a society?

In the pre-attack setting, the fundamental descriptive task is to determine how institutions and social structure establish ranges and limits to all important behaviors and thus, by inference, to post-attack behavior. In the post-attack setting, the fundamental descriptive task is to determine the ways in which damaged social structure can lead to a weakening of structural and institutional constraints upon behavior, and to assess the problems which may arise from the resulting indeterminacies in the specification of behavior. The remainder of this volume will explore these questions and, where possible, offer ways of resolving them.

Underlying this discussion of institutions and institutionalization is the proposition --- based partly on empirically observable phenomena and partly on an analytic model --- that human behavior occurs as a result of a process of increasing specification within a hierarchy of behavioral determinants. Behavioral determinants are hierarchically ordered in the sense that they form a series of interlinked levels, which progressively determine particular acts of behavior with increasing specificity and precision, the closer the analysis of behavioral determinants approaches the level of the individual actor and his behavior. In this light, the consequences of a marriage between two individuals are the result of several complex, hierarchically ordered sequences of determinants; the subsequent acts of a couple reflect these determinants. The two individuals approach the situation of marriage with individual past histories as individuals and interacting sets of expectations about the future. In addition, the resources they can bring to family

building are in part the result of particular opportunities given them by conditions which have been subject to a series of determinants in the economic sector. Now, as they marry, they form a new unit of social organization --- the family --- as a result of acts by religious and/or political-administrative organizations. Their receipt of legitimacy from these organizations depends, in turn, upon a prior establishment of these organizations as agencies of the institution of marriage. In turn, the marriage institution depends on the ability of the polity to establish domains of rights and obligations. This, in turn, assumes a view of citizenship and of the world of the citizen in which rights and duties have meaning; the marriage partners, as citizens, probable co-religionists, and sharers of a world view, must value these rights and duties in at least minimum ways. Working back down the chain from this level of ultimate values and projecting the marriage partners forward through time, it is possible to see the hierarchies of determinants and possibilities which allowed them to be married as having resulted in a continuing state which defines future opportunities for behavior partially in terms of the rights and obligations of marriage. A certain repertory of behaviors is now open to the couple, just as another repertory is closed. These limitations imposed by these repertories are enforceable, ultimately by reference back up the chain to institutionalized legal and religious obligations.

A less conventional example of hierarchical ordering and specification is to be found in the institutional "management" of discoveries in the scientific enterprise, where acts of creativity and discovery will proceed from the scientist's personal history and capacities, present ability to be stimulated, and the continuing structure of knowledge in his discipline. Especially in the arena of basic science, the values to which he subscribes may constantly press him toward making a "discovery". After discovery, however, his intellectual contribution becomes surrounded by its own institutional status. Its meaning and significance are judged by the scientific community, which can accept or reject the claims of the scientist. If his claims are accepted, the scientist's discovery limits and redefines directions in which subsequent inquiry will proceed. Simultaneously, the accepted status of his discovery can be invoked to prevent others from going back and redoing his work and reclaiming it as their own, and thus not only initiating a circle of claim

and counterclaim which can lacerate personal relations, but also diverting and disorganizing the cumulative development of science.

The scientific community highly values insight, originality, disciplined creativity, and cumulative scientific knowledge. To manage the potentially conflicting impulses unleashed by these values, scientists define the status of a discovery both intellectually and institutionally. The intellectual valuation is in terms of the content of the discovery; the institutional valuation begins in assigning to the scientist the right to claim his originality and to enjoy the prestige of his discovery. By defining both the intellectual and institutional status of a discovery, scientists institutionalize their high valuations of both originality and the cumulative development of knowledge. Institutionally, they place a discovery, an act of creativity, within a sequence of continuing behavioral determinants organized over several levels.[83]

There is an obvious potential danger in too strictly held a model of hierarchical specification of behavior --- all behavior will be forced into a mold of strict analytic determination, in violence to many unresolved problems in the social sciences and their methods. Even where applicable, the model of hierarchical ordering and specification must consider many hierarchies of specification as contributors to final acts. Nevertheless, with proper caution, a dual concept of hierarchical specification of behavior and hierarchical ordering of behavioral determinants is useful for pointing analysis from visible individual behavior toward those institutional complexes in society which set fundamental limits to behavior and, in doing so, create the elements of social structure. In this context, the hierarchical concept is a way of defining the workings of institutional process.[84]

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[83] The institutional functions of setting priorities in scientific discovery are considered in Robert K. Merton, "Priorities in Scientific Discovery: A Chapter in the Sociology of Science", American Sociological Review, XXII, 6 (December, 1957), pp. 635-659, from which the discussion in these paragraphs derives. See also Kuhn, op. cit.

[84] The concept of hierarchical ordering appeared earlier in this chapter, in relation to the problems inherent in propositional inventories; see pp. 45-59, above. For lucid descriptions of the hierarchical ordering of factors associated with collective outbursts and the hierarchical relations among components of social action, see Smelser, Theory of Collective Behavior, op. cit.

Institutional-Behavioral Systems of Society, and Situational Dependence of Behavior as a Clue to Their Pre-Attack and Post-Attack Functions. The concepts of institution, institutionalization, and hierarchical ordering and specification permit the analytic differentiation of a complex domain of behavioral events between the level of the whole society and the particular individual. In turn, this permits the full significance of the four principal target systems of a society to emerge. These systems --- the ecological system, the individual system, the social system, and the cultural system --- were given preliminary definition earlier in this chapter.[85] To review briefly, the total society can be distinguished into four systems which constitute two broad categories of targets. The category of organic entity targets is composed of two classes: the individual system and the ecological system. The individual system is the general name for each human actor, who is a discretely defined, continuing organism in continuing relation with his environment. To this earlier definition should now be added the equally significant, basic social characteristic of the individual system: his personality structure, which is his deeply ingrained, continuing, distinctive, total organization of motives, needs, past experiences, attitudes, beliefs, and perceptions which he brings to all situations of social interaction. Each individual forms an individual system; in the aggregate, individual systems form an ecological system, which is a population of individuals in an equilibrium state with its physical environment.

Complementary to the category of organic entity targets is a category of behavioral entity targets. This category is similarly composed of two classes: the social system and the cultural system. In this particular usage,[86] the term "social system" refers to the total structure of social action in stable patterns of role and organization in society. The cultural system is the total, integrated, continuing body of values, symbolic meanings, techniques for symbolic manipulation, and generalized perceptions of the existential and the desirable which characterizes a society, together with its concrete manifestations in the physical artifacts used in daily social life.

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[85] Cf. pp. 28-37, above.

[86] As was noted on pp. 88-89 above, the term "social system" can have variable denotations.

Both broad categories of entities and their component classes of system were originally derived to create the grounds for showing how behavior and social patternings are just as much "real" targets of attack as are inert, physical masses of matter. The most important attribute which each system shares with every other is that its existence as a system must be inferred from the behavior of individual, acting organisms. It was said that attack effects are real effects, exerted simultaneously against both individual behaving organisms and the stable patternings of behavior which they generate.

Before continuing, several cautions concerning the meaning of these four systems as target systems are in order. It should be made clear, first, that these four systems are not separate "chunks" of a total society. Rather, they are alternative ways of viewing the same social reality, in order to spell out its important complementary characteristics. They are overlapping perspectives. In this sense, they are behavioral systems, although they can be distinguished into categories of organic entities and behavioral entitities. To arrange these four systems in a group of separate boxes in a diagram may tempt the reader to conclude that these four systems, in present form, are components of a model of society.[87] But such a model could not be considered earlier in the chapter, because the conditions under which the four systems were derived emphasized their utility as categories for descriptively and denotatively reorganizing behavioral evidence.

Yet, the significance of these four behavioral systems lies beyond the power which they give the analyst to label the principal sectors of society which become attack targets. Their interest lies in the proposition that they are not only behavioral but are also systems. They are systems not necessarily because they may resemble sub-system components of a potential societal model; instead, they are systems because they are, in the most general sense, complexes of institutions. As institutional sectors of societies, the four behavioral systems each consist of hierarchies of behavioral determinants and behavioral specification. As hierarchies, these systems limit and shape the potential behavioral responses which can occur as a result of damage having been done to them by thermonuclear attack.

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[87] Graphically, there is a certain incongruity in putting the "Individual System" in a box of size equal to the "Social System" or the other two systems!

An important corollary of the system metaphor and model used in this chapter is that systems tend to be self-maintaining. As a set of reciprocally interlinked and mutually influencing components viewed cross-sectionally through time, a system will have the potentiality for translating events in and effects against one component to all the other components of the system. Over time, the result of this translation will be a tendency toward the self-maintenance of the system --- "other things being equal".[88] Institutions are not systems in an exactly parallel analytic sense. While institutional functioning may produce crucial functional consequences for society, and while behavior produced as the result of institutional process may have specific consequences for supporting the social structure within which institutional patterns are expressed, the principal initial significance of an institution as a system is relatively concrete. An institution is a system because it is a hierarchical ordering of behavioral determinants and a hierarchical specification of the limits on behavior. Earlier, "institution" was defined with special reference to social structure and the social system in a more limited sense. Institutions there were specific complexes which represented the translation of value patterns into social structural arrangements and concrete behaviors. Now, if an institution is viewed in the most general sense as a relatively closed, relatively integrated hierarchical ordering, its general properties can be shown to apply to other behavioral systems as well as to the specific structure of social action defined as the "social system". The institutional concept applies to all four behavioral systems because these systems constitute two parallel hierarchies of behavioral ordering as well as two broad categories of social reality. The categories of organic entities and behavioral entities exhibit institutional characteristics within their constituent systems and between their constituent systems.

How is this so?

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[88] One of the principal theoretical issues to be pondered in this volume is the problem of specifying the limits beyond which effects in a system cannot be translated into other, compensating effects in other components of a system. Specifically, what are the conditions under which a social system in the most general sense would cease to be a system? The ambiguous state of the system metaphor-model in the present state of knowledge means, however, that it may not be possible at present even to define all the relevant issues.

Individuals, with the capacity for acting in visible social behavior and interaction, derive as organic unities from a population in balance with environment. Specific, concrete acts of individual behavior derive in this sense ultimately from a series of events which enable a population to support the reproductive processes which create individual biological organisms. In turn, as these organisms are created, their individual life-functional requirements form the basis for the beginning of their individual life histories, which begin the development of each individual's social personality. The individual brings his biological life-functional requirements, his life history, and his current personality structure to the immediate situation in which behavior occurs. This situation is the immediate environmental location of social behavior, where the individual is presented with a variety of requirements for particular acts and a set of alternative action possibilities. From the capacities and requirements he brings to the situation of action and in response to requirements of the situation, the individual acts out visible behavior. The population as an ecological system cannot continue as a patterned system without having an orderly flow of new individuals into it, as a result of each generation's having met the basic ecological requirements for maintaining the necessary population characteristics which enable the reproductive cycle to become stable. This implies especially that within the population, some minimum number of males and females will be able to produce over the long run a stream of new children. Each individual deriving from the population will, in turn, establish the basis for a coherent address to new behavioral situations, which will be the arenas through which his own behavioral system ultimately maintains itself and the ecological system of his parent population. The key to the development of this coherent address to behavioral situations is in the development of a stable personality structure, which permits the individual to meet the requirements of life needs and adapt himself to the requirements of impinging social situations. In a sense, the individual's personality is a form of inner institution, from which he proceeds to address the requirement of specifying acts. Thus, the development of the individual human personality is analogous to a process of institutionalization in the social system. For the individual, this process of institutionalization is socialization, through which the individual is given in his younger years

the perceptions of reality and conceptions of what is desirable and meaningful that will govern his approaches toward other individuals.

Thus, the ecological system is an institutional system which begins in the broad arraying of a population in ecological space and which ends in the creation of new, living beings with organic life functions. The individual is an institutional system in that he develops a life history with its continuity stemming from the requirement that he interact with the social-physical world in meeting his most primitive life requirements. From this most primitive level a personality structure begins to evolve, which leads later to the capacity for directed action and specific social acts.

Within the category of behavioral entities, a similar set of hierarchical processes exists. Individual social behavior begins, ultimately, in the framework of what the basic cultural patterning of the society deems as existential, desirable, and feasible. The cultural system is not merely these broad patterns of value and symbol, however; it consists also of the more explicit definitions of the world which have been worked out by participants in the culture, using basic cultural definitions. This process of working out the meaning of a culture can result, in industrial society, in explicit, specifically instrumental techniques for viewing and manipulating the world. In the industrial social structure, the culture becomes specified and institutionalized through the development of specific systems which define and prescribe for the world. In industrial society, these systems are, especially, ideological systems, which define social reality and desirable modes of addressing it both individually and collectively, and scientific-manipulative systems, which embody rules and procedures for the development of a cumulative, self-maintaining body of knowledge about the world. These systems permit actors to work out specific sequences of steps in a general program for defining their actions in the world. These sequences of steps are specific normative or technological systems which tell the actor what ought be done. As a consequence of this explicit defining of steps, the more general patterning of cultural values may come under pressure to change. A principal tension in a society undergoing the process of change and increasing industrialization is the collision between its older values and beliefs, which have set the limits of the culture, and the attempts to test their

meanings in refined systems of concrete prescriptions. In the older industrial social orders, this tension resulted from the collision between the metaphysical assumptions and values of religious patternings and the development of empirically oriented scientific procedures and prescriptions, which modified and redefined the earlier views. In the newer industrial societies, this tension has often taken a highly political, ideological form. Here, the tension has been between the values of traditionalized, folk culture and the requirements of developing programs and goals for running a nation-state.[89]

The other major behavioral system within the category of behavioral entities --- the social system --- begins analytically in the translation of cultural values and definitions into social values. These are the specific propositions to which individuals refer back in explaining their allegiance to particular patterns of social structure and behavior. While similar to normative prescriptions in their level of generality, these social values are analytically not part of the cultural system. This is because they are (1) not open to dialogues over their validity, and (2) taken as the specific sources of the legitimacy of particular institutions. Thus, a simplified, basic social value proposition would be, "Education is necessary and good". Partly from this proposition would derive the legitimacy of the educational institutional nexus and the specific discipline exerted by the social structure of educational organizations.

Moving down the chain of determinants in the social system --- it is the institution in its specific meaning which patterns social values into particular structures of social organization imposed upon collectivities of individuals. A collectivity here is an aggregate of individuals in a social setting, viewed apart from its organizational characteristics; when patterned according to broad institutional requirement or particular goal, the collectivity becomes an organized group. It is this level of specific, organized group life which forms the basic social structure of society. In turn, roles are the positions individuals occupy in this structure of group life, and it is their role behavior which is the primary manifestation of their organized, visible social behavior.

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[89] Cf. Footnote 70, pp. 81-82, above.

Both of these hierarchies end in visible behavior by individuals, while both hierarchies begin in very general, patterned systems. Conversely, the existence of the general, patterned systems is inferred by constructing them from the organization revealed by individual organisms engaging in unit acts of behavior. Because both hierarchies have a common root in the visible behavior of individuals, they exhibit a common characteristic of great importance. This characteristic is their common relationship to the general situation in which visible, measurable behavior occurs. The "situation of behavior" is not only the non-human, physical environment which surrounds the immediate acts of individuals; it is also partly the subjective definition which individual social actors give to it.[90] The requirements of the immediate situation partially provide the kinds of behavioral

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[90] The "definition of the situation" received its most influential statement in the words of Thomas. Thomas discusses the functions of the definition of the situation in these words:

> Preliminary to any self-determined act of behavior there is always a stage of examination and deliberation which we may call the definition of the situation. And actually not only concrete acts are dependent on the definition of the situation, but gradually a whole life-policy and the personality of the individual himself follow from a series of such definitions. ...
>
> There is therefore always a rivalry between the spontaneous definitions of the situation made by the member of an organized society and the definitions which his society has provided for him. The individual tends to a hedonistic selection of activity, pleasure first; and society to a utilitarian selection, safety first. Society wishes its member to be laborious, dependable, regular, sober, orderly, self-sacrificing; while the individual wishes less of this and more of new experience. ...
>
> It is in this connection that a moral code arises, which is a set of rules or behavior norms, regulating the expression of the wishes, and which is built up by successive definitions of the situation. In practice the abuse arises first and the rule is made to prevent its recurrence. Morality is thus the generally accepted definition of the situation, whether expressed in public opinion and the unwritten law, in a formal legal code, or in religious commandments and prohibitions.

William I. Thomas, "The Four Wishes and the Definition of the Situation", in Parsons et al. (eds.), op. cit., Vol. II, pp. 743-744 (emphasis in original). Note that what have been called in this chapter institutional patterning and social values stem directly, for Thomas, from the defined situation of action.

alternatives open to individuals; simultaneously, the immediate situation can also require a specific response, as in a situation of crisis or stress impinging upon the individual from this immediate environment. Because of this dependency of the final choice of acts or direction of behavior upon the situation of action, the level of concrete, visible behavioral specification can be said to be relatively dependent on the immediate situation of action. Conversely, the most general level of system patterning --- basic ecological-population balance and basic cultural patterning --- can be viewed as relatively independent of situation. This is not to say that they are totally independent of situation; it is to say only that the effects from immediate situations of behavior must be translated into effects on the level of general system patterning, and that this translation can occur only over time and as the result of a complex summation of effects in many specific situations.[91]

To aid in an understanding of the complex conceptual relationships which have now been developed, Figure I-7 (p. 111) outlines the two sets of parallel levels through which visible behavior receives increasing specification, in the order in which each level specifies behavior. The range is from Level 1, the level of acts and roles and role behaviors composed from immediate behavior, to Level 7, the most general level of system pattern. Because increasing specification of behavior means increasing dependence of behavior on its immediate situation, each level of specification within a hierarchy of levels is more or less dependent upon the immediate situation of action and behavior for its role in determining behavior. Thus,

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[91] This opens up an important dual hypothesis regarding responses of whole societies to disaster: The ability to estimate damage to a society will lag significantly behind the ability to estimate damage to individuals; furthermore there is no necessary one-to-one relation of direct proportionality between the number of situations of immediate damage to individuals and the amount of damage done to the whole society

One of the key tasks in further studies of post-attack society will be to develop an adequate methodology for comparing the kinds of individual situations of action that result following various orders of thermonuclear attack. This would be preparatory to developing canons for translating these now-comparable situations into a summation which could lead to an estimate of the damage to larger elements of the social structure and institutions.

Figure I-7

DEGREE OF SITUATIONAL DEPENDENCE OF ELEMENTS
IN HIERARCHIES OF SOCIAL ACTION SPECIFICATION

	Organic Entities	Behavioral Entities	
	MOST GENERAL LEVEL OF SYSTEM PATTERNING		
Level			Relative Situational INDEPENDENCE
7	Population Characteristics, in Relation to Environmental Constraints	Systems of Symbol, Value Patterning	
6	Reproductive Cycle-Maintaining Processes	Ideological and Scientific-Manipulative Systems	
5	Individual Life Functions	Normative or Technological Prescriptions for Action	
4	Individual Life History	Social Values	
3	Individual Personality Structure	INSTITUTIONS	
2	Action Possibilities	Collectivities and Groups	
1	Acts	Roles and Role Behaviors	Relative Situational DEPENDENCE
	VISIBLE BEHAVIORAL RESPONSES		

each level of behavioral specification is also automatically a relative placement on a scale of relative situational dependence or independence in behavioral specification.[92]

It should be noted that as specific links in the process of behavioral specification, institutions occur at Level 3 of the Figure, where they are analytically parallel to personality structure. As has been suggested and as will be developed, however, institutional processes and complexes in the more general sense occur at other levels of both hierarchies.

It is the processes of specification which occur in both major hierarchies that determine particular behaviors. The hierarchies form parallel systems which jointly specify particular action outcomes in the situation of action, by increasingly specifying the limits of ranges of potential action and concrete behavior. With increasing specification of behavior comes increasing situational dependency of the process of specification. This variable linkage between levels in the process of specification and the situation of behavior provides an important clue to the ways in which the four behavioral systems function to generate and maintain a total social system, particularly as this social system responds to the effects of thermonuclear attack.

An examination of Figure I-7 reveals that Level 1 and Level 7 contain the end points for two parallel hierarchies of behavioral specification. Equally significant is that these two levels contain the four centrally defining elements which characterize the four systems of behavioral specification. For organic entities, Level 1 is the level of specific acts of organisms, from which are inferred the existence of the individual system. For behavioral entities, Level 1 is the level of particular roles and role behaviors, from which are inferred the existence of a rudimentary social structure and the social system. At the opposite end of the hierarchies, for organic entities Level 7 is the level of the visible, patterned population of organisms in balance with a physical environment --- in short, the

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[92] Because the analysis can work from either direction, the arrow connecting the continuum Relative Situational INDEPENDENCE - Relative Situational DEPENDENCE in Figure I-7 is double-headed.

ecological system. Parallel to this, for behavioral entities, Level 7 is the level of the total patterned system of values, existential propositions and assumptions, and symbolic modes which has been called the cultural system. Level 1 and Level 7 contain the centrally defining elements which characterize these four systems. Furthermore, both levels each contain one system composed of organic entities and one system composed of behavioral entities.

This placement of the four systems in the two parallel hierarchies suggests important characteristics which each system possesses in relation to the others. By being observed and defined through the immediate organization of concrete acts, the individual system and the social system are relatively dependent on situation. That is to say, while the individual system and the social system are stable analytic entities, their concrete, visible functioning occurs in complex, immediate situations which present constraints on behavior as well as alternatives for behavior and which directly shape resulting social behavior. In contrast, by being defined as patterns of organisms or cultural elements, the ecological system and the cultural system are relatively independent of the immediate situation of action. While their patterns may be shaped markedly and altered over time as a result of behavior in the situation of action, these two systems will not respond directly as patterns (i.e., as patterned systems) to events in the situation of action. There must be a temporal lag, as effects on the level of visible behavior among individuals are translated to effects on the level of ecological and cultural patterning.[93]

This difference in the relative degree to which the four systems are affected by events in the immediate situation of action points to the differences in the ways in which the four systems will shape the responses of individuals and the total society to thermonuclear attack. A thermonuclear attack or other truly massive disaster must express its initial effects in the immediate physical and social situation of action. Attack effects will be expressed in terms of individuals killed

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[93] This is the analytic and theoretical reason why the deaths of even large numbers of individuals and temporary aberrations in the behavior of some of the survivors do not necessarily mean the "end of civilization" after a truly massive disaster.

or wounded, non-human objects destroyed or damaged, and behaviors stimulated by the attack. Necessarily, the individual and social systems must be the locus of responses to the attack and adaptations to its effects. Indeed, social adaptations to attack effects must be adaptive behaviors, occurring in the now sharply modified situation of action. On the other hand, the question of whether ecological and cultural systems have been "damaged" by the attack depends for its answer on a complex assessment of the damage to the individual and social systems. Important in shaping the kinds of weightings to be given to damage to the individual and social systems will be the extent to which individuals and groups have taken post-attack measures which follow their understandings of the requirements for maintaining the ecological system and for both maintaining and responding to the norms of the cultural system. Thus, damage to systems at the most general level of system patterning will be not only a complex translation of damage to individuals and to the social system; it will also be shaped by the responses of individuals and groups acting within the constraints imposed by the ecological and cultural systems. This has a multitude of concrete implications for adaptation to attack effects. For example, the total physical environment of society affects individual behavior through the immediate situation of action. After attack, behavior multiplied over thousands of immediate situations may represent --- consciously or unconsciously --- a restoration of the short-term and longer-term conditions of environmental balance required to maintain the ecological system.

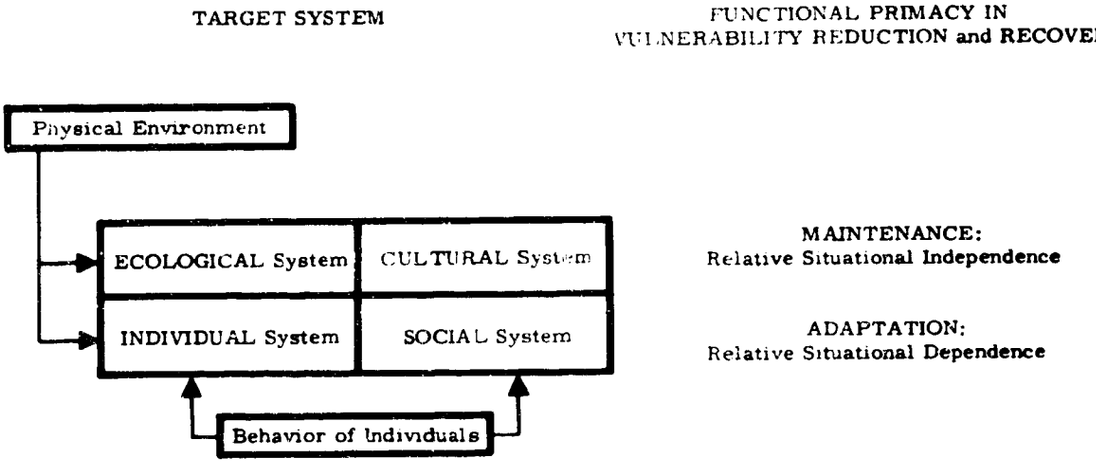
As the loci for behavioral responses to attack effects, the individual system and the social system can be called systems with adaptive primacy of function in the post-attack situation. As continuing systems, removed by several levels from immediate attack effects, and as loci for continuing patterns to which individuals refer consciously or unconsciously in making responses to attack effects, the ecological system and the cultural system can be called systems with maintenance primacy of function in the post-attack situation. As systems with adaptive primacy, the individual and social systems function to provide the center of attempts to adapt the society to the attack. As systems with maintenance primacy, the ecological and cultural systems function as the loci for maintaining the defining characteristics of the society as a society, relatively removed from effects on particular individuals

or elements of social structure. As systems with maintenance primacy, the ecological and cultural systems are patterns of constraints of several orders, to which adaptive behavior must refer. In a limited sense, for a short time after attack the ecological and cultural systems are the society, to whose requirements individuals and behavior in the social system and social structure may consciously or unconsciously refer.

The general pattern of analytic relationships which exists among the four systems as targets of thermonuclear attack is portrayed in Figure I-8. "Function"

Figure I-8

POST-ATTACK FUNCTIONAL PRIMACY OF FOUR SYSTEMS OF SOCIETY



means here the effects which a particular system has in mediating responses to attack. Implicit here is a larger perspective on a theory of society. It is tempting to say that the four systems outlined here provide an exhaustive scheme for describing the basic systems which provide all the fundamental institutional patternings for a society. If this were the case, would it not follow that these systems constitute the skeleton for a theory of society?

It should be remembered, first, that these systems are alternative ways of looking at complex social phenomena which are only partially separable, either as concrete or as analytic entities. Second, while these systems do provide an exhaustive set of categories for placing the consequences of behavior and social

action, they were stated with immediate reference to their utility in sorting out the effects of thermonuclear attack. Therefore, the conception of their functions as systems of society is, in the first instance, a narrow one: Each system has either a primary maintenance or adaptation function in mediating the responses to nuclear attack which will be relevant to societal survival. The impact of thermonuclear attack is the base point from which the post-attack primary functions of the four systems are assigned. While it is analytically neat and economical to use the attack as the base point for institutional processes and changes, the vital issue of specifying the pre-attack, "normal state" functions of societal sub-systems is begged. The introduction of the attack as the reference point for defining institutional response and the functional primacy of societal sub-systems serves to heighten the visibility of institutional function; at the same time, it establishes a presumptive argument that the post-attack primary functions of the four systems are also their primary pre-attack functions. In a sense, however, this is working backwards: from an abnormal and artificially clarified institutional state to an inference about pre-attack functions --- functions which would not be fully specifiable without the introduction of the attack and the pressures toward responding to it.

Thus, one of the most important problems in assessing the proposition that the primary post-attack function of a major system of behavioral specification would be its primary pre-attack function is to develop a more adequate description of sub-system functions for a "normal" state of society. Without introducing the device of an attack, what can be said about these functions? The attempt to approach the issue from this direction raises an issue which is partially obscured by the use of attack as a reference point. The attack reference point enables the analyst to specify a primary function for each of the four systems, in mediating behavior and social action following attack. For the pre-attack state of society, however, the question must be: What is the function of each system in mediating and specifying routine social behavior? Over time, what are the effects of this routine behavior on maintaining and specifying the institutionalized preconditions of behavior? The "institutionalized preconditions" are, of course, the four institutional-behavioral systems. In a "normal state" of society, how are these systems perpetuated as coherent systems? What are the processes which perform maintenance and

adaptive functions for them, so that they can continue to act as larger systems of behavioral determinants in the whole society?

An approach to this question is an invitation to develop the system metaphor-model farther, in order to suggest how system functions may be performed internally to each of the four systems, in order to meet their own requirements for maintenance and adaptation as systems. A fully developed statement of the system metaphor-model is beyond the scope of the present chapter or volume. Such a statement would be required in laying the foundation for a general theory of social system dynamics, however, for a significant part of the change occurring in a society under "normal" circumstances (as contrasted with massive catastrophe impinging on the society) should be analyzable in terms of pressures created by the functioning of the social system as one of the four key institutional-behavioral systems. It has been said that as a system, the social system has adaptive primacy of function in the societal situation following thermonuclear attack. This means that particular, organized adaptive responses by various sorts of collectivities will have their locus in this system, which is the organized social structure of the society. In both pre-attack and post-attack situations, however, the social system has its own structural differentiation into sectors with quite different functions. Economic institutions within the social system are the center of particular activities of combining resources to produce needed products and services. Thus, the economic sub-system must generate particular categories of means for coping with the consumption requirements of both the pre-attack and post-attack social system and social structure. In contrast, the political institutions of the social system establish ways of debating and deciding social goals, toward which means can be allocated. In contrast with the specifically adaptive functions provided by the economic sector, the political sector of the social system is a locus for maintaining and restating values and ends. In this light, the political sector --- along with other major sectors such as religious institutions and educational institutions --- functions to maintain the pattern of the social system and, through the maintenance of this pattern, to maintain the coherence of the total organized society.

Within the social system, therefore, sub-systems can be distinguished at the specific institutional level, according to maintenance or adaptive functions which can be imputed to them. The analysis can regress toward even more concrete levels within these sub-systems. For example, within the economic sector, patterns of corporate organizational enterprise provide a locus for particular processes of production. These processes produce outputs which can be used to meet adaptive needs outside the economy or to provide inputs to other sectors of the economy before final demand. Thus, production processes meet varieties of adaptive need. In contrast, mechanisms of money and credit maintain stable standards of value and enforceable, generalizable discipline over transactions within the economy. Carrying the regress even one more stage --- within an enterprise of production, there is customarily a sharp differentiation of sub-system, into organizational elements with adaptive primacy and maintenance primacy. A sector of management as well as the whole production division or element in the enterprise will be concerned with generating relevant, responsive outputs to meet the requirements of the "situation" in which the enterprise is doing business. Simultaneously, another sector of management and the lower echelon staff and service divisions will be concerned with the maintenance and enforcement of general financial, accounting, personnel, and company benefits policies, which meet internal needs of corporate organization and maintain its coherence of structure and behavior even under conditions of sharp competition or rapid technological change.[94]

For each level of this regress, the "adaptive" sub-system is relatively more dependent upon the situation of action than is the "maintenance" sub-system.

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[94] For an elaborately worked out but tentative statement of a possible way of viewing sub-system relations within the economy and relations between the economy and other major sectors of the society, see Parsons and Smelser, op. cit. Also see Parsons, "Some Principal Characteristics of Industrial Societies", loc. cit. A critic of this general approach to social theory might argue that this view is especially well adapted to the description and analysis of the economy and the polity, but less well adapted to the analysis of other major institutional sectors within the total social system. Among the unfinished items on the agenda of contemporary social analysis is a complete discussion of this potential criticism.

For each level, the "situation of action" and visible behavior becomes more circumscribed.

Could such an analysis be applied to the other three systems of society as well as to other institutional sectors within the social system? For present purposes, it may be sufficient to suggest that such an analysis is feasible, even while leaving the analysis of functions in the post-attack societal situation at the level of the four main systems of society which have been developed. Clearly, without the intervention of a massive thermonuclear attack as the agent for defining primacy of functions, a general statement of social functions must show a more completely differentiated analysis of the internal structure of these systems and a demonstration of how this functional differentiation may be related to characteristics and changes of the equilibrium state attained by the whole society. Even in the post-attack situation, however, the four major systems may each --- on general analytic grounds --- have secondary functions for the whole society and, internally, they may have functionally differentiated sub-systems of their own. But instead of providing an elaborate conceptual analysis of these possible varieties of structure and function in this chapter, the description of possible sub-system characteristics in each of the four major systems will be approached in a more intuitive, empirical, pragmatic way later in the volume. In Part II of this volume, the five "criterion essays" will outline some of the specific features of the internal ordering as well as general functioning of the individual, social, ecological, and cultural systems in American society. Instead of providing a fully closed, rigorous description of these four systems as systems, these essays will seek to define the most salient traits of these systems in mediating responses to thermonuclear attack. Through an understanding of these traits, it may be possible to lay a more complete foundation for the further analysis of the structure and function of each of the four systems in a "normal equilibrium" state of society.

The total but tentative view of society in its post-attack situation which results from the analysis as it has been developed so far is summarized in the

metaphor-model given graphic representation in Figure I-9 (p. 121).[95] This Figure combines the information given in Figure I-7 (p. 111) and Figure I-8 (p. 115). The analytic levels of Figure I-7 are shown now as levels of the four systems. It will be noted that Levels 5 through 7 of Figure I-7 are levels of the ecological and cultural systems, while Levels 2 through 4 of that Figure are levels of the individual and social systems. Level 1 of Figure I-7 is both the fundamental level of both hierarchies and the level at which inferences about the individual and social systems begin. This level therefore has a dual status: It is both the visible manifestation of the individual system and the social system and a total domain from which inferences about all four systems are made. The analysis does not begin to consider actual individual or social systems until "acts" can be related to the action possibilities, choices, and outcomes of a particular individual, or until "roles and role behaviors" can be shown to be actual properties of any aggregation of individuals --- most generally termed a "collectivity". Thus, Level 2 is the level at which visible behavioral evidence is translated into the first inferences about the individual and social systems as analytic entities. For this reason, Level 2 is depicted as straddling the boundary between "visible behavior" and the individual and social systems depicted as constructs.

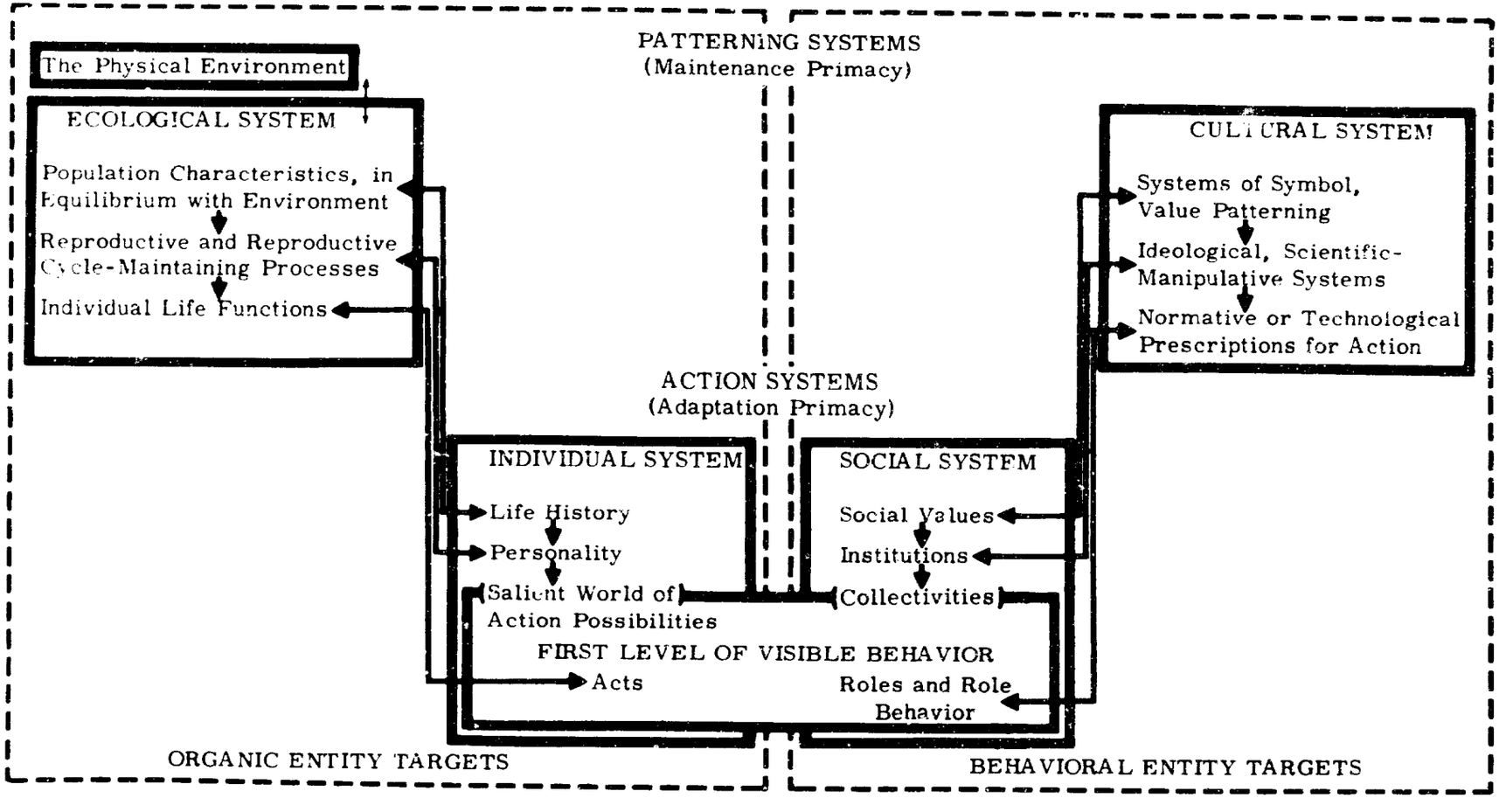
Within each of the four systems depicted in Figure I-9, downward-pointing arrows indicate successive levels of determinants (or decreasing levels of analytic generality) in the specification of the conditions for acts or of concrete acts themselves, as that system functions to determine acts. The two-headed arrows between the ecological and the individual systems and between the cultural and the social systems relate system levels which are at the equivalent level of analytic generality when systems are compared; thereby, they indicate a complex causal connection among the determinants of acts. Acts are specified simultaneously in both parallel hierarchies (the ecological-individual hierarchy and the cultural-social hierarchy), as a process of specification relating the most general level of

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[95] A preliminary, working paper statement of this metaphor-model by the present author is given in Human Sciences Research, Inc., An Approach to the Study of Social and Psychological Effects of Nuclear Attack (McLean, Va.: Human Sciences Research, Inc., March, 1963), pp. 158-160.

Figure I-9

HIERARCHIES OF ACTION SPECIFICATION FOR EACH MAJOR BEHAVIORAL SYSTEM OF SOCIETY



system patterning (the ecological and cultural systems defined at Level 7 of Figure I-7) to the "First Level of Visible Behavior" (Level 1 of Figure I-7). At this first level, the parallel hierarchies of determinants and specification are joined in a two-directional relationship which derives from the overlapping meanings of "visible behavior". In the analytic ordering of behavioral determinants and in the specification of behavior, however, the progression is not directly from or toward this first level all the way in an unbroken sequence of direct causal relations up to or down from Level 7 at the most general level of system patterning. Rather, an event at one level in a system automatically causes events or the conditions for events at an equivalent level of analytic generality in the related system elsewhere in the hierarchy.[96] The event at that level then sets in motion events at other levels within the related system as well as within the original system.

In Figure I-9, the causal sequence among determinants has been shown, for convenience, as moving downward, from the more general analytic level to the more particular analytic level. For purposes of clarity, potential acts of social behavior are viewed as starting at a very general level of system patterning. Through increasing specification, particular acts are increasingly likely to occur at the level of visible behavior. This means that as an event is increasingly specified within a given system, its conditions are created at an equivalent level within the sister system. Yet, it is important to keep in mind that to refer to system levels as equivalent is not to say that they occupy the same level of analytic generality. For any given event at the level of visible behavior, its counterpart events within the ecological and cultural systems will occur at a greater level of analytic generality than that same event described in terms of the levels of the individual or social systems. If it were possible to manipulate analytically Levels 2 through 4, which occur in the individual and social systems, corresponding effects and resulting sequences of effects at Levels 5 through 7 would always necessarily occur at higher levels of analytic generality, since these levels are farther removed from the situation of action.

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[96] This is the practical analytic consequence of saying that the four systems are alternative ways of viewing the same behavioral phenomenon.

In summary, the seven levels outlined in Figure I-7 are not two parallel hierarchies of step-by-step causes, leading in unbroken progression from Level 7 to Level 1 or from Level 1 to Level 7. Rather, while each level is more general or more specific than the others, depending upon its relation to the situation of action vis-à-vis the others, it is not simply a direct determinant of events at the next higher or next lower level. Instead, it may be simultaneously a determinant of events at the next higher or lower level and a determinant of events at an equivalent level of analytic generality in another system. Events occurring within the hierarchy of organic entities will simultaneously affect sequences of determinants and specification within both the ecological system and the individual system, because events involving organic entities are, simultaneously, events on equivalent levels of these two systems. Events occurring within the hierarchy of behavioral entities will affect sequences of determinants and specification within both the social system and the cultural system in a parallel way.

As a practical matter, the effects of a concrete event on the systems of society will begin at the level of visible behavior, even though it should be possible from an analytic point of view to trace changes in the four systems by beginning at any one of the seven levels. A concrete event of visible behavior which occurs enmeshed in the situation of action will translate throughout the seven levels. On the other hand, changes which are analytically describable in terms of any one of the levels beyond visible behavior and the situation of action may be translated ultimately into changed patterns of determinants of specific acts. A great remaining task of social theory --- both as a theory of social structure and of social change --- must be to develop an even more precise scheme for stating and analytically manipulating the ways in which the reciprocal relations between visible behavior and institutional events create changes at social levels beyond the individual which constrain and limit his behavioral possibilities.

Institutional Dimensions as Ranges and Limits to Social Vulnerability and Recovery. In assessing the social effects of thermonuclear attack, an evaluation of the damage done at the level of the individual system and the social system is of primary importance. As has just been proposed, this is because the individual and the social systems are relatively dependent on the situation of

behavior and social action. Through attack effects expressed in the complex environmental-social situation, inferences are constructed about impacts and changes in these two types of system, just as in the pre-attack situation it is behavior in the situation of action which provides the ingredients for inferences about the existence of these two systems. As organic entities, individuals are known through discrete acts. As a behavioral entity, the social system emerges as a construct from the patterned acts of individuals in recurring, reciprocal relations. Changes in the kind and scope of social acts provide clues about the events occurring in the two relatively situationally dependent systems and, ultimately, about events occurring on the level of the two systems which are relatively independent of situation. Furthermore, from these changes in behavior and social action which can be said to be induced by attack effects derive inferences about changes in the composition and structure of all four systems.

It should not be concluded, however, that this approach advocates an "atomistic behaviorism". While items of behavior and social action in the immediate situation of action provide the empirical base for defining the four complementary institutional-behavioral systems, the patterns manifested by these four systems exhibit their own characteristics as total patterns and as constellations of elements of patterns. To deal with these characteristics, a number of conceptual levels and conceptual devices beyond the level of visible behavior were introduced. The centrally unifying theme that runs through the discussion of these conceptual tools is the role of institutions and institutionalization in patterning social action. Institutionalization is a general process manifested in all four systems of behavioral specification. In a general sense, then, the patterns exhibited within all four systems are institutional patterns. More specifically, however, institutions are the interwoven network which provides the pattern of norms and behaviors which are organized in the social system. In turn, the stable pattern of interaction formed within the social system as a result of the functioning of its institutions is the social structure of the society.

Although in many respects analytically equivalent to the other three systems of behavioral specification, the social system therefore becomes the primary focus of any attempt to understand the dimensions of the damage which

a thermonuclear attack can wreak on complex industrial society. The social system in this sense is the locus of many levels of social organization deriving from the situation of action. As the locus of the processes which produce the social structure of the society, the social system is the domain of the society in which individuals produce behavioral entities deriving from the situation of action.

The social system is that aspect of society in which individual behavior relevant to all other system-aspects of society is given collective organization. The actual social behavior which produces new individuals to maintain the ecological system is ordered by the specific institutional processes of the social system. The norms and existential propositions and the symbolic tools of the cultural system are both maintained and redefined as a result of specific institutional processes within the social system. For the individual system, stable behavior in relation to other individuals constitutes the rudiments of the social system. Within the social system of industrial society, the division of labor and differentiation of institutional and organizational sectors forms the general locus for both setting goals and producing means for the direction of the whole society. For all four systems of the society, the institutional processes of the social system provide the orderings of individual behavior into social action, which result in the institutionalized patterns of these systems.

To understand the way in which the total structure of society becomes the target of thermonuclear attack, it is necessary to show how the huge analytic domain of the social system --- with its institutional and social structural levels --- provides the dimensions of the attack. Because this complex domain can be known and studied only through the use of analytic and conceptual tools (even though these analytic tools refer to real patterns of events beyond simple summations of individual items of behavior), the social dimensions of thermonuclear attack must allow for the translation of weapons effects into events which influence social structure. Customarily, however, "dimension" is an attribute of inanimate or animate objects or, more generally, of physical space and time. In this sense, the "dimensions" of things are those general attributes of things through which their existence can be measured and compared with other things. These dimensions include such attributes as length, width, and temporal duration, which can be

broken into generally applicable, generally valid quantitative units. Since the social system and the other systems of society are, in one sense, analytic constructs, in what respects can they and their levels and elements have "dimensions"? How are the "physical" effects of thermonuclear attack expressed in "social" dimensions?

Throughout this volume, the term "dimension" is used in a sense somewhat broader than but not inconsistent with its usual meaning in the physical sciences and engineering.[97] It will have two principal but complementary denotations when applied to institutions and social structure. First, a social dimension may be a generalized range or continuum within which an attribute may be expressable as a quantitative value or set of values. Second, a social dimension may be an analytic construct which defines, demarcates, or labels the existence of an empirically observable social entity and which permits the analytic differentiation of that entity from other social entities.

These two usages will often work in complementary ways in the understanding of a particular phenomenon. As an analytic entity which defines, demarcates, or labels, a social dimension is a separable domain or set of behavioral events, which can be a target of attack effects. Thus, an occupational stratum in the social system is a domain of social roles which can be changed by attack effects and in terms of which attack effects can be expressed. This domain of behavioral events can be qualitatively differentiated from other domains, and as a qualitatively differentiable domain it is a social dimension of attack. To understand the relation of events in this domain to other events in other domains of the social system and the total society, however, it is necessary to express the structure and changes in this domain in terms which permit comparison with other events in other domains.

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[97] The problem of defining "dimension" in this context is part of the more general problem of considering the nature of the parameters, operative variables, and social units which are necessary to describe the effects and changes wrought by nuclear attack in society and on behavior. Neil J. Smelser formulates this general problem in Chapter VI below, "Methodological Issues in the Social Analysis of Nuclear Attack and Recovery", especially in Parts III and IV of that chapter.

Therefore, it is necessary to know how this domain can have quantitative as well as qualitative values, how these values can vary over time and condition, and how these values can be compared with other domains which have values. Thus, the occupational stratum must be redefined as a set of variable values. In this particular case, the initial problem will be to find a way of counting the incumbents of the stratum and determining variations in the composition of this stratum. Quantitative values will then have been assigned to variable characteristics. When this has been done, the significance of the social dimension as a "separable domain" will be reasserted, for it will be necessary to explore how these quantitatively expressable values may be associated with events in other domains. After a study of changes expressed as changes in variable values, the task becomes one of studying temporal associations among events within several separable domains. In terms of the immediate example, the problem becomes one of examining how changes in the composition of the occupational stratum may be associated with possible changes in the functioning of the other, differentiable sectors of the society, especially with reference to the economic division of labor and the allocation of social status and political power.

Thus there is an interplay between these two uses of "dimension". In the first usage, a social dimension is an attribute of a domain of social events or a social entity which may be expressable in generalized, quantitative terms. This expression may be as an aggregate measure --- as in a census of individual traits in a population; or, it may be as a degree of intensity within which a trait can be expressed along a continuum --- as in a measure of anxiety in individuals or groups; or, it may be as a rate of change --- as in a measure of the increase in communication following disaster; or, it may be as in the quantitative value of a weighted index --- as in the extent to which interconnections among individuals can be inferred from behavioral evidence and the existence of a stable social structure thereby imputed.

But these values are values of variables, through which the differentiating characteristics of particular social entities are expressed. The occupational stratum has a number of variable values, expressed, for example, in terms of particular occupational roles, which may take variable forms in a scale of

variable social rankings and which may have variable numbers of occupants. Similarly, types of collective outbursts may express variable structure, intensity, and scope. A riot may be of shorter duration, greater physical violence, and with less organization or coherence than a fad. A fad may require the mobilization of particular means for particular changes in the life style of a group and it may have particular institutional effects in the economy; while a rioting crowd may also have goals, some of which may derive from deepset grievances and needs, the goals and expressive outlets sought by a rioting crowd may shift quickly over a variety of possibilities. In the comparison of a riot and a fad as examples of collective outbursts, variables within which both phenomena can be arrayed permit the analytic differentiation of the total set of features and values which distinguish one phenomenon from the other. The social dimensions of these collective phenomena permit the empirical representation of each phenomenon in terms which permit the simultaneous description of that phenomenon as a discrete entity and the comparison of that phenomenon with other entities. Meaningful social dimensions will permit the characterization of the salient traits of a behavioral phenomenon; the conversion of these dimensions into variables with quantitative ranges which take on a variety of values permits the comparison of the traits of one phenomenon with those of another.

When a social phenomenon is defined through social dimensions which distinguish its separable domains or sets of behavioral events, its traits are being described through such dimensions as structure, goal-orientation, membership composition, and modes of manifesting cultural values. Here, "social dimension" is very close to being synonymous with "trait" or "attribute". Yet, this usage of social dimension is cast in terms which imply the comparison of one phenomenon with another. Thus, even such generally descriptive and generally theoretical terms as "role" can be taken as social dimensions of a phenomenon: While organized collectivities of many informal and formal sorts have roles and role behavior, these roles will be defined in characteristically different ways, according to type of collectivity. Changes in them will have different consequences for different types of collectivity. With some descriptive social dimensions, it is but a short step to expressing them as quantitative variables in generalized,

numerical ranges: An occupational stratum may be perceived in terms of a theoretical model of society but defined operationally in terms of specific numbers and kinds of occupations and their members. On the other hand, with some descriptive social dimensions, it may be more difficult to develop a fully adequate translation into terms of quantitatively variable ranges expressed in standard numerical terms. The treatment of "structure" as a general social dimension may require its analytic breakdown into a number of measures of relationships and processes which contribute to a total structural pattern. These will include measures of phenomena such as degree of role differentiation, degree of interpersonal communication, number of kinship ties, and extent to which people perceive interests in common with other people. Instead of a direct measure of social structure, it may be necessary to construct an index of the relative degree of the existence of a social structure.

In sum, then, for present purposes of measuring and assessing social structure, the concept of social dimension tends to fuse two meanings. In common with other usages of "dimension", a social dimension can be a generalized range or continuum, expressed in terms of quantitatively variable values. At the same time, a social dimension can be an analytically defined domain of events, which forms a meaningful entity for social observation and analysis. In both cases, the dimension is a result of the application of the observer's analytic perspective. In both cases, the most effective analytic manipulation of behavioral events observed to occur within social dimensions requires the restatement of these events in terms of variables appropriate to the relevant dimensions. Units of social analysis or behavioral events can be manipulated with most rigor when their traits or aspects can be expressed in terms of variable values and changes in these values, within social dimensions which permit analytic comparisons of events occurring in different domains or at different times.

Table I-5 (p. 130) suggests the relationship among these meanings of "social dimension", for several representative categories of interest. In one sense "dimension" as quantitative range of variable values" is synonymous with "measure". All these dimensions result in particular quantitative values, which are measures of the states of the behavioral domains to which variable values have been ascribed for the purposes of study. These measures are points on a potential

Table I-5

SOME REPRESENTATIVE DIMENSIONS FOR DESCRIBING SOCIAL STRUCTURE	
DIMENSION AS QUANTITATIVE RANGE OF VARIABLE VALUES: The Generalized Expression of Ranges of Variation of Substantive Variables.	DIMENSION AS A DISCRIMINABLE DOMAIN OF BEHAVIORAL EVENTS
AGGREGATE MEASURE	A GROUP OF SIMILAR OR IDENTICAL SOCIAL ROLES: Expressed in variable terms, for example, in terms of traits of individuals within a stratum or total population.
DEGREE (example, of INTENSITY)	COMMITMENTS OF INDIVIDUALS TO THEIR ROLES, AND THE SALIENCE OF THESE ROLES TO THEM Expressed in variable terms, for example, as observable, visible preoccupation of individuals with one role compared to another, or expressed feelings of subordination to demands of role (in latter case, measure could overlap with technique employing range on aggregate measure).
RATE (example, of CHANGE)	FORMATION OF SOCIAL MOVEMENTS, IN THE CONTEXT OF CHANGES IN POLITICAL AND ECONOMIC ARRANGEMENTS OF SOCIETY Expressed in variable terms, for example, as votes cast for a political party, overt commitments (including economic contributions) to charismatic leader, formation and expression of a political ideology and program; temporal view can be cross-sectional or dynamic.
INDEX, COMPOSED OF INDICATORS	SOCIAL STRUCTURE, GENERALLY EXPRESSED Expressed in variable terms as a weighted combination of measures of personal status, interpersonal communication patterns, exchange relations, normative sanctions (especially legal and kinship), and other discoverable patterns.

scale of measurements. As a quantitative range of variable measurement values, a dimension is defined as the range within which measures made according to particular procedures do vary. "Dimension as quantitative range of variable values" does not have full meaning in a particular analytic situation unless it can be conceived as expressing the values of a particular variable, which defines the traits of a particular, substantive behavioral domain.

When the reader examines Neil Smelser's discussion of the comparative method in Chapter VI of this volume, he will note that Smelser provides a contrasting formulation of some of these same analytic issues.[98] The two complementary categories of social dimension, which are separated in Table I-5, become in Smelser's discussion contrasting aspects of several "types of dependent variables". These types of dependent variables are, in turn, one of three "dimensions" along which Smelser develops a typology of comparative analysis. The difference between these two discussions points up the broadening of the analytic concern as this volume proceeds. In the present chapter, the purpose is to locate the particular analytic levels at which "society" may be said to become the target of thermonuclear attack. The particular levels which emerge as being of central importance are the social structure, which can be directly broken by attack, and the institutional complexes which are organized through the social structure, for which the social structure is a visible manifestation. In contrast --- Chapter VI assays the whole question of the kind of evidence which is available for making inferences about the social effects of thermonuclear attack. Chapter VI reflects the shift from the first chapter's conceptual analysis of elements of society to the attempt in Part II of this volume to marshall all available evidence about the actual structure of society and its possible post-attack functioning. In Chapter VI, Smelser's purpose is, in part, to develop a scheme for evaluating within one frame evidence from a variety of particular studies within a particular society at a particular time, evidence from several societies at different times in their histories, and evidence resulting from different research approaches to different levels of

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[98] See especially pp. 595-607, and Table VI-1, p. 607, below.

society or social life. As a consequence, the dimensions for his typology include the kinds of dependent variables which are included in Table I-5, plus a more general numerical dimension and a temporal dimension.[99] This redefinition of the social dimensions of Chapter I underscores the fact that the conceptual apparatus of the present chapter is a tentative address to the problem of defining an approach to the study of the vulnerability of social structure. A constant tension in the central theme of this volume is between the need, on the one hand, to use firm concepts of social structure and institutional patterning to define the social targets and the need, on the other hand, to see these concepts as unresolved and subject to continuing analytic challenge and refinement. Particularly when placed in the perspective of the comparative method, dimensions of social structure and institutional patterning become dependent variables in the continuing attempt to describe the empirical topography of society. Depending on context, then, "dimension" will sometimes mean a generalized range of variable values which describes a significant behavioral domain. Other times, it will expand in meaning to include a number of types of ranges and their conditions; under these circumstances, the inquiry has broadened from a consideration of the social dimensions of thermonuclear attack to the more general problem of setting the significant dimensions for describing and explaining social processes and the functioning of society.

In the short run, the immediate focus on the social dimensions of thermonuclear attack permits some pragmatic restrictions to be applied to the meaning of "dimension". The hierarchies, systems, and levels of society described earlier in this chapter can be used to identify particular constellations of targets in the visible social structure of American society. Thus, the population is a target, as an aggregation of individual traits and as a set of continuing relations among and within such elements of the social structure as families and kinship networks. As a series of behavior patterns, collectivities organized for productive purposes,

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[99] The numerical dimension is set by "the number of social units --- whether one or more than one --- that are involved in the comparative analysis". Page 596. The temporal dimension is dichotomized, with regard to "the static or dynamic quality of the comparison". Ibid.

and material resources about which decisions must be made, the economy is a target. As a set of offices, bureaucratic arrangements, and communication processes for conferring power and legitimacy and receiving decisions, services, and direction, the political structure of society is a target.

Expressed in these terms, the population, economy, and political organization of society are social structural targets in the first instance. As social structural targets, they are targets not merely because the unit-elements which compose them can be damaged, destroyed, or altered by attack, but because the relationships in which these units exist can be broken or altered. Here the analysis undergoes a crucial shift. While social structure is a pattern of relationships, the durability of this pattern depends on the extent to which it has been institutionalized --- through commitments to norms, sanctions, and the organizational forms which embody social institutions. In predicting individual and group responses to damage inflicted to the social structure, therefore, the fundamental question is not "What is left after attack?" While important, this question is secondary to a more fundamental question posed by the nature of institutions themselves: "How will institutional patterns continue to guide behavior?"

A rich body of fantasy holds that under conditions of cataclysm, civilization will dissolve.[100] As Sidney Winter points out in his beginning to Chapter IV of this volume, such a position obviates any further attempts by social scientists to predict what might happen.[101] Because pre-attack institutional patternings have preemptively forced certain choices of behavior on individuals and groups in pre-attack society, and because these choices have become customary modes for expressing not only "normal" but also "deviant" behaviors, it is reasonable to assume that institutional patterns will persist in their influences and effects following attack.[102]

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[100] Chapter II, below, opens with a discussion of some of these fantasies. See also Vestermark, loc. cit., for a discussion of some fantasies about possible future states of the pre-attack society which tries to prepare civil defense.

[101] Below, p. 332.

[102] The beginnings of one answer to the argument that thermonuclear attack would collapse social controls into a wild spate of socially disapproved, anarchic behavior may lie in the extraordinary power institutional patterns have in defining

The question, "How will institutional patterns continue to guide behavior?", need not be construed to imply that institutions will cease to be operative.

Because stable patternings of social relationships embodied in social structure provide the concrete manifestation of institutions, an attack on the social structure of a society must be in some sense an attack on its institutions. In some sense, the dimensions of attack on social structure must be the dimensions of attack on institutional structure. To understand the reciprocity of effects between institutional and social structural levels when social structure comes under attack, it is necessary to recall the analytic relationship between institutions and social structure. Pre-eminently, a social institution is the patterning of behavior according to value selections and value commitments.[103] This determination does not necessarily strictly determine all the social structural arrangements which may grow out of it. For example, marriage as an institution may require new organizational forms following a severe war, when eligible males have declined in numbers and females experience a radical change in the competition for marriage partners. Individuals and the society at large may insist upon marriage as the source of legitimacy for families, but this does not preclude new forms of courtship arrangements --- such as open advertising --- from arising. Nor does marriage insulate the family from manipulation by political institutions and their agents, who may wish to encourage rapid repopulation following a war by granting subsidies and

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(Footnote 102, continued) "deviant" or "bad" behavior in society. Without holding to the position that all deviant behavior is strictly purposive and/or "functional" in society, it is nevertheless possible to observe that elaborate institutional constraints tend to force the selection of certain modes for departing from approved paths of behavior. See Robert K. Merton, "Social Structure and Anomie", in Merton, op. cit., pp. 131-160, and Erving Goffman, Stigma: Notes on the Management of Spoiled Identity (Englewood Cliffs, N.J.: Prentice-Hall, Inc. Spectrum Books, 1963). See also S.N. Eisenstadt, Comparative Social Problems (New York: The Free Press, 1964) and Robert K. Merton and Robert A. Nisbet, Contemporary Social Problems: An Introduction to the Sociology of Deviant Behavior and Social Organization (New York: Harcourt, Brace & World, Inc., 1961). Parsons provides an analysis of the institutionalization of the social roles surrounding illness in Parsons, The Social System, op. cit., Ch. X, "Social Structure and Dynamic Process: The Case of Modern Medical Practice", pp. 428-479.

[103] See the discussion on pp. 96-99, above.

honors for rapid procreation. This official involvement in family life may extend to the establishment of voluntary or compulsory child care centers, where children may be nurtured in units away from their families for significant portions of time. It is noteworthy, however, that family structure in complex society under stress does not appear to shift toward patterns of polygamy.[104] Of similar interest is the pressure to restore an abstract medium of exchange in the economic institutions of complex society, after severe disaster has forced a short-run shift toward the barter mechanism of exchange.[105] Because institutional patterns appear to permit some short-run and longer-run variations in their social structural manifestations, they do not appear to determine strictly precise structural and organizational forms. Nevertheless, institutions do appear to create pressures toward the creation of general types of social structural arrangements, according to the basic type of society in which the institutions function.

Thus, there appears to be a basic correspondence between institutional patterns and types of social structure. As a result, dimensions suitable for the description of behavioral events occurring within a social structure as well as for the description of social structure itself give a general indication of the effective scope of particular institutions in determining behavior. Here the analysis infers the existence of institutional patternings from social structural relations which bind individuals. Reversing the direction of the analysis, it is possible to see institutional patterns as setting the basic range --- or "constraint set" --- within which particular social structural forms can be evolved and manifested across a succession of concrete situations of action. Put another way, institutions provide

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[104] On several grounds, the example of the Mormon pioneers of Utah does not appear to be directly comparable. While polygamous marriage conferred certain advantages in an agricultural and handicraft economy, the basis for this practice in Mormon institutions was initially theological. The practice was officially abolished in 1890, well before the beginning of significant industrialization in the Mountain West.

[105] On this question, see Chapter IV, below. Hirshleifer provides useful comparative perspective, in Jack Hirshleifer, Disaster and Recovery: A Historical Survey (Santa Monica, Calif.: The RAND Corporation, RM-3079-PR, April, 1963).

the general "criteria" which establish the ranges of legitimate and probable alternatives within which organizational and structural forms are specified. Institutions function as the level of behavioral specification at which many more general forms of determinants converge, before these determinants crystallize the ranges and limits of particular social acts and structures.

In these ways, dimensions of social structural vulnerability to thermonuclear attack reveal particular structural manifestations of institutional sectors of society. Proceeding now from an analytic point of view as well as from the evidence provided by particular structural manifestations of institutions, it is possible to advance a number of working propositions concerning the place of institutions in the assessment of the vulnerability of social structure and social behavior patterns to thermonuclear attack:

(1) Institutional patternings produce overlapping and complementary networks of concrete social structure in society: Industrial society is characterized, in part, by the complex differentiation and integration of these networks.

(2) As foci for commitments and structural possibilities, institutional patternings establish the basic range within which both socially approved and socially disapproved behavior and social structure evolve.

(3) The principal concrete indicators of institutional patternings are patterns of normatively organized behavior and social structure.

(4) Establishing the existence of an institutional patterning within the total social system is partly an inductive process, based on the examination of the evidence provided by social structure, and partly an analytic process, based on an adequate conceptual differentiation of the basic levels and elements of the social system.

(5) Institutional patternings will "mediate" attack effects just as they prescribe ranges of pre-attack behavior and organization, in the sense that they constitute the principal range of behavioral and structural options which attack responses can take.

(6) Specifying the institutional patternings of society, as these patternings may individually and collectively function, will reduce a significant portion of the uncertainty and analytic variance in projecting the domains within which behavioral responses are likely to occur.

(7) While there are other levels of society which provide characteristic social dimensions and data on response to massive disaster, the ranges and limits to behavioral and structural forms established by institutions and their concrete manifestations constitute the initial analytic level on which attempts to predict and reduce social system vulnerability must begin.

(8) Therefore, a theoretically and empirically adequate description of the basic institutional patternings of society, together with some attempt to project the particular behaviors and structural forms that may result from these patterns, is fundamental to any attempt to understand responses which individuals in a social system may make to thermonuclear attack.

The five essays in Part II of this volume proceed from the general position outlined in these eight propositions. The essays begin with detailed delineations of key institutional sectors of industrial society, beginning with a discussion of social responses to attack which will be highly dependent on situation (in Chapter II) and concluding (in Chapter V) with a broad assessment of the interplay between cultural values and administrative systems in mediating attack responses. In Chapter VI, a broader look is taken at the varieties of dimensions which can be used to describe the paths that attack responses may follow. Underlying each of these essays is the attempt to describe the institutional constraints which result in ordered patterns of social action in each major sector of society. This descriptive effort assumes the central importance of institutions in acting as "criteria" for social action; in their attempt to provide a comprehensive, summary, and often eclectically based treatment of institutional patternings as criteria for specifying ranges and limits to behavioral and structural patterns as immediate constraints upon action, the five essays of Part II are "criterion essays".[106]

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[106] The meaning of the term "criterion essay" is explored in somewhat more detail in the Appendix to Chapter I, below. It will be noted there that the term also has a more limited connotation, with reference to defining the criteria for attack countermeasure systems.

Throughout this volume, a central institutional theme recurs: The analytic dimensions of institutions and social structure necessarily describe the ranges and limits of concrete post-attack responses. It must follow, therefore, that the dimensions of institutional patternings and social structure are the basic framework within which the problems of societal vulnerability and recovery must be conceived and described.

The Format of Post-Attack Knowledge

The immediately preceding discussion of social institutions emphasizes the need for more adequate basic knowledge of institutional functioning in society. A dominant theme of the entire chapter has been the ambiguities inherent in present attempts to develop the basic tools for achieving knowledge of possible post-attack social conditions. In looking ahead now, it is important to ask, "What will be some of the characteristics of usable 'knowledge' about possible social responses to thermonuclear attack?" In answering this question, it will be useful to review parts of earlier discussions in this chapter.

Concepts, Events, and Discriminable Behavior. The basic position toward knowledge taken by all contributors to this volume is that of scientific nominalism. In Chapter VI, Neil Smelser summarizes this philosophical position in relation to a statement of dependent variables, by saying:

> With respect to this characterization of dependent variables I hold an explicitly nominalistic position: that the dependent variables are not in any natural way "given" in social reality, but are the product of a selective identification of aspects of the empirical world of social phenomena by the investigator for purposes of scientific analysis.[107]

Doubtless there would be some disagreement among the contributors on nuances of meaning; no attempt was made at any time in the preparation of these studies to develop a statement of "nominalism" to which all would feel forced to subscribe. Nevertheless, the view of the real social world taken in these pages can be

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[107] Below, p. 596.

characterized by several orientations upon which the observer-analyst builds his picture of the world.

First, each analyst addresses a social world upon which he has a prior analytic perspective. Within this perspective, and in response to regularities exhibited by the social world as he observes it, the analyst discriminates events at points in time and processes over periods of time. These events and processes become entities whose traits can be given analytic status as concepts and variables. Initially, a concept is a label for an entity which is discriminable within the analyst's perspective; this label describes the entity and often encapsulates or unifies several of its complementary meanings.

In identifying entities which can be conceptually manipulated, the analyst breaks social reality according to a number of dimensions. But the scientific orientation toward social reality requires not merely relevant, adequate labeling of entities and arraying them in a matrix of significant dimensions; it also presses the analyst toward testing his present description of the world by developing statements about what that world is likely to be in the future. If present conceptual tools adequately describe and explain reality, their ultimate test should lie in their ability to create an accurate picture of the future --- a future over which the analyst himself does not have direct control in the present, but whose characteristics he can ultimately compare with his present image of them. In creating his picture of the future, the scientifically oriented analyst will attempt to cast it in the form of a number of testable predictions about what reality will be then and about the events that will occur in that reality. These predictions or projections will often be hypotheses or propositions, which refine and extend the format and grammar of the simple declarative sentence.

Projections, Propositions, and Assertions with Varying Degrees of Certainty.[108] Reality, broken into concepts and dimensions, is a static, fragmented portrait. To explore the relations among attributes of reality as well as to

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[108] See the discussion of propositions and propositional inventories, pp. 45-59, above.

predict its future states, some format is needed for examining possible associations, sequences of effects, and structures among these attributes. The customary, fundamental format for examining these relations is that of the proposition: a sentence containing some form of asserted relation between a subject and a predicate. Both subject and predicate may take the form of simple descriptive concepts, or variables, or more complex analytic constructions. The utility and general status of the proposition as an item of "knowledge" will be crucially determined by the kind of relationship "asserted" to exist between subject and predicate.

There are different bases from which a relationship between a subject and a predicate can be asserted to exist. These different bases result in varying degrees of certainty which can be attributed to the relationship. Since a proposition is an assertion about a given state of reality, and since the degree of certainty with which the relationship can be asserted is the ultimate measure of the validity of the proposition, the value of the proposition as an item of "knowledge" will depend upon the extent to which its asserted relationship has been tested and found satisfactory, by one or another canon of inquiry.

Propositions defined and tested against a scientific canon of inquiry will move through a set of characteristic stages which, in a sense, form points on a scale of degrees of certainty. When a proposition emerges from its antecedents in the experience of the investigator and the verities and traditions of his arena of scientific knowledge, it customarily takes the form of an hypothesis. An hypothesis is a prediction of plausible association or relation between the subject and the predicate --- which are usually expressed as analytically manipulable variables. The crucial test of the hypothesis is to create those conditions under which the association or relation between the subject and predicate is predicted, and then to determine whether in fact that relation exists. If it does, and if the hypothesis can be subjected to replicated tests, then the accumulating body of confirming instances and their known own ranges of variations permit the analyst to treat the hypothesis as an established proposition about the real world. This proposition will seldom be cast as a flat declaration, however; most often, it will be put in the form of a conditional prediction, which asserts that a relation between subject and predicate will hold under given conditions and with given degrees of probability. Some

conditional predictions are, in certainty and plausibility, little more than tentative hypotheses; others have been so thoroughly tested with such accessible methods that they are the first ingredients of scientific laws.

No matter what the degree of certainty felt to exist in a proposition built on a known or knowable relationship, there is always the implication that a proposition adopted after scientific scrutiny remains tentative. Any hypothesis may require another test, which provides the first disconfirming instance; an established proposition or "finding" may be part of a larger set of propositions which are discovered to modify, qualify, and ultimately redefine it; a "law" may be subjected to radical overturning, if a new orientation toward knowledge revolutionizes a field of inquiry. Indeed, when an analyst holds a proposition to be so firmly established that nothing can overturn it, there is ground for the presumption that he has departed from scientific canons. At one of the farthest points on the scale of degrees of certainty is, then, the proposition that has become so firmly established in the analyst's mind that it has taken on characteristics of prophecy or revealed knowledge. At this point, the whole motivational, cognitive, and value structure of the analyst becomes an issue in determining the validity of the proposition. At this particular far point on the scale of certainty, issues of ideology and value will be superimposed on issues of empirical description, validation, explanation, and prediction.

Relevant Conditions as Constraints on What Is Known. This review of concepts, events, discriminable behavior, and propositions of varying certainty is a generalized, conventional model of scientific inquiry.[109] It could be applied to many tasks. But the present task is one of extraordinary complexity.

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[109]Perhaps the emphasis of this sentence should be on the word "conventional", in the sense of "careful" and "safely sensible". The author recalls a vivid discussion over which he was chairman some years ago. An eminent physicist had just criticized the kind of model presented in these pages as being true as far as it went, but as being a limited account of how scientific ideas originated. If that was so, said an ardent undergraduate, where did scientists "really" get their ideas? The physicist savored the smoke of his famous pipe for a moment, then replied softly, "From dreaming ... from dreaming".

Every analytic task has its characteristic ambiguities. Frequently these derive from difficulties in obtaining the full range of data or in setting a full context for the data. Complementing and reinforcing these difficulties may be the problem of finding the most adequate concepts for expressing these data.[110] In every case, the available data and their treatment will be governed by the simplifying assumptions and heuristic devices built into the contemporary state of knowledge. These assumptions and devices may increase the feasibility of gathering data and developing a body of descriptive and explanatory propositions. In return, however, they introduce characteristic patterns of procedural constraints and ambiguities in the resulting knowledge.

The present task is to describe individually and collectively the social patterns which will influence individual and group responses to thermonuclear attack upon the American society. The ultimate practical purpose of the resulting information is to set an outline of requirements for countermeasure systems which might reduce the vulnerability of Americans to such modes of attack. Several fundamental ambiguities have already been considered. Among these are the limitations in the body of theory and data available to describe American institutions, and the kinds of analytic steps that must be taken to compensate for these inadequacies. Also among these is the impossibility of subjecting projections of possible social effects to direct empirical validation and test. To these kinds of uncertainties and the measures that must be taken for reducing them must now be added at least two additional categories of conditions which must guide attempts to generate knowledge of the post-attack social world.

First, while there has been much discussion of the ambiguities which result from attempting to describe the target of thermonuclear attack, there has been little exact discussion of the attack itself. Yet, attacks may vary according to strategy

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[110] Merton and Kitt's discussion of the evolution of the concept of "reference group" is an example of how more adequate concepts can result from the attempt to explain anomalies in data. Robert K. Merton and Alice S. Kitt, "Contributions to the Theory of Reference Group Behavior", in Robert K. Merton and Paul F. Lazarsfeld (eds.), Continuities in Social Research: Studies in the Scope and Method of 'The American Soldier' (Glencoe, Ill.: The Free Press, 1950), pp. 40-105. See also Kuhn, op. cit.

and pattern. It would require not much more than commonly available knowledge to suppose that a sudden attack using a few weapons against a small number of metropolitan centers will have social effects somewhat different from the effects created by a systematic bombardment of all centers of metropolitan population over a series of some days. Similarly, effects from a "counter-force" attack directed against missile sites scattered over regions of small population might be expected to create effects different from a "counter-value" attack directed against a clustered, urbanized national population. Since the actual choice and actual effects of an enemy strategy can never be fully known in advance of an actual application of that strategy, how is it possible to consider a range of attack contingencies in advance? In what ways does the decision to study the possible effects of any particular group of likely attacks create the possibility that the analysis will fail to develop the full range of knowledge needed to estimate the important attack effects that must be considered in order to design systems to reduce societal vulnerability?

Here a very important organizational question enters. In national security planning, designing the most adequate, precise model of American behavior and institutions may depend on access to strategic assumptions and options which are unavailable to the designer of the model because of security requirements. As a result, opportunities for the kinds of corrections or revisions in the model that might be required through the most relevant tests of it may be limited.[111] Is there any systematic compensation to be made for limited access to highly sensitive information? Can this compensation be introduced so as to enable the analyst to avoid excessive diversion of his time to what may prove to be interesting but irrelevant constructions?

Second, without adopting the epistemological position that the nature of knowledge depends on its uses, it is nevertheless necessary to know the particular uses which may be demanded for varieties of knowledge about the post-attack social world, and how these uses may constrain particular inquiries. At first glance, it

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[111] For an analysis of some of the intellectual and sociological constraints imposed by security policies, see Edward A. Shils, The Torment of Secrecy: The Background and Consequences of American Security Policies (Glencoe, Ill.: The Free Press, 1956).

might seem that the issue here is really one of "basic" versus "applied" research, with the pressure toward resolving the issue being in favor of concentrating on topics which are tractable to immediate, particular uses in the design of specific countermeasure systems. Accordingly, the conventional objection to this solution would be some variant of the query, "Does not premature concentration on particular problems inhibit the development of general, theoretically based models and approaches which, in the long run, might prove to be a more adequate foundation for grounding and producing immediate, practical knowledge?" Following this paradigm of the conflict between pure and applied research, it could be argued that the kind and format of post-attack knowledge which do evolve will be significantly influenced by whichever fundamental orientation toward research knowledge wins the encounter.

Actually, the question of the constraints imposed by the uses of post-attack knowledge appears to be more subtle and complex than this formulation of the issue. Because of the ambiguities inherent in the post-attack situation as an object of study in the social sciences, any knowledge about it will be likely to have both "pure theoretical" and "applied" implications. Projecting even the most narrow and firmly based findings into a post-attack situation not immediately accessible to scrutiny implies a number of theoretical and epistemological decisions.

The consequences of this tendency for post-attack social research questions to broaden toward general questions of method and theory are reinforced by the different implications which the same research finding can have for different categories of users. The finding that except under certain limited, specifiable conditions, panic is not likely to be a serious problem in the immediate post-attack situation provides an illustration. For the operational official who may someday be right on the scene, in charge of managing a group of survivors, this finding may provide both comforting reassurance in the present and suggestions for conveniently concrete steps which he can take to avoid collective panic if the attack comes. By contrast, the official at a somewhat higher administrative level, who is charged with designing countermeasure systems to cope with weapons effects, may utilize this finding about panic principally as it suggests particular features of countermeasure systems which ought to be avoided. The identifiable conditions of panic

become conditions which he wishes to avoid building into a system. The system may be a physical system, such as a shelter system or set of shelter entrances, from which he wishes to eliminate physical features which might combine to induce panic. Or, the system may be a general social policy and its supporting contingency plans, such as a plan for tactical or strategic evacuation from cities, within which the planner needs to regulate the flow and behavior of large numbers of people within time limits. Finally, at the highest administrative level, the finding that panic is unlikely to occur except under limited conditions may be of primarily ideological and political significance. The policy-maker may use the finding to counter fantasies of mass panic following attack, created by opponents of countermeasure programs or systems. Similarly, he may use the finding as the basis for eliminating the panic factor from general estimates of the feasibility of particular countermeasure systems.[112]

The placement of the user of an item of knowledge within a particular level of organizational concern and understanding will constrain not only the use of that item but also the definition of new knowledge which might build upon it. Continuing with the example of the finding on panic --- contrasting and even contradictory research emphases may evolve from the stimulus of a finding perceived within a

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[112] There are many findings which are similarly susceptible to a variety of perceptions. In Chapter IV, below, Sidney Winter analyzes the marked differences between present levels of consumption in the American economy and the needs of mere subsistence. See especially pp. 397 - 402, below. The excess of consumption over subsistence is such that there could be a marked drop in per capita consumption as a result of attack without departing from per capita consumption standards which were acceptable earlier in this century. Here, the finding is probably of most interest to the highest level policy-maker and systems designer, who needs precise estimates of excess capacity and redundancy in the economy in order to design systems and criteria for managing the whole economy following massive disruption. The finding may be of less interest to the operating official, who needs particular techniques and standards for parceling out what he has and for getting items which may be crucial to survival or longer-term viability in his immediate area. This serves only to emphasize the point in the main text: that the same finding will have quite different significance at different levels of a hierarchy of concern. As a result, the finding may create quite different sorts of pressures. Indeed, an operating official without training in economics might find Winter's analyses rather depressing, at first glance.

series of limited frameworks. To the operational official or worker, the finding on panic can be utilized in meeting his immediate needs to train and control groups. From his point of view, such a finding may be the first of many similar findings he would like to have on the problems of collective behavior in the immediate situation of action. He will clamor for similar findings and for manuals which tell him how to use them. On the other hand, to the highest policy-maker, the finding on panic may be an example of a general proposition about the human capacity to endure stress. In justifying, funding, and encouraging the design of complex counter-measure systems which are difficult to test until the horrors of thermonuclear bombardment come to pass, this policy-maker will feel the need of numbers of such general propositions, as he estimates the relevance of these systems to human needs and capacities and to other national objectives. To fulfill his needs, the policy-maker may feel he requires knowledge which generally maps a large terrain of human capacities; this may lead ultimately to propositions whose content is far removed from assays of collective behavior in the immediate situation of action.

There is nothing inherently contradictory in these contrasting emphases, but they can have the practical consequence of limiting the directions taken by a survey of the institutional and social structural determinants of possible post-attack behavior. Insofar as the analyst specifically attends to the requirements of different levels of a complex policy problem, as defined by different levels of concern within the same organization, he will find that the hierarchy of roles within that organization creates its own characteristic constraints upon the knowledge he produces. As a result, the specific direction of his investigations as well as the general framing of his findings may be guided by contrasting and only partially complementary formats.

Generally, a constraint on scientific knowledge is any internal or external concept, assumption, orientation, restriction, or situational pressure which guides the inquiry toward a "partial" description and explanation of a complete domain of reality. The several categories of constraint affecting the search for post-attack knowledge appear to pose unusual challenges to the scientifically oriented analyst. As has been suggested, these challenges derive not only from the ambiguities inherent in present social science approaches to an uncertain future, but also from

the pressures that the inquiry be explicitly relevant to possible enemy strategies of attack and to the interacting, and sometimes conflicting, needs of users of post-attack knowledge. Once objections to the scientific and methodological feasibility of post-attack social inquiry have been temporarily put to one side, the quest for manageability in the general direction of inquiry and the particular format of the findings will press the analyst to pay close attention to the strategic assumptions, countermeasure system design problems, and general needs of the users of his findings. This need not prostitute the objectivity of his inquiry. Nor should the analyst feel that by being partial, his findings are necessarily invalid. Instead, by examining these pressures on the direction of his inquiries, the analyst should be able to see them as constituting part of a special case study in the "sociology of science". Indeed, the pursuit of post-attack knowledge in the contemporary strategic and organizational environment offers an unusual opportunity to explore the ways in which constraints interact to produce a body of knowledge with particular, distinguishing characteristics.

While a case study of the "sociology of post-attack inquiry" cannot be provided here, it must be observed that several sets of strategic and organizational constraints and assumptions have contributed to guiding the studies in this volume toward a concern with institutions and social structure. To understand some of these pressures and perspectives which have come from outside the domain of the social sciences, it is now necessary to consider this strategic and organizational environment in somewhat more detail.

Attack Assumptions as Sources of Uncertainties: The Assumption of Massive Attack

The degree of success of a particular strategy employed by a potential enemy will be the final determinant of the first effects of thermonuclear attack against American society. Attempts to describe the most likely potential patterns of attack will be important devices for focusing inquiries into the state of the post-attack social world. As is noted in a study of nuclear attack hazard to the Continental United States:

> For some planning purposes neither the authoritativeness nor the realism of the attack effects assumptions is important. In fact, the convenience of having the hypothetical attack pattern for an exercise remain unclassified in the security sense dictates that it remain sufficiently unrealistic to permit such status. But for planning any program related directly to the mitigation of the effects of any actual attack or coping with it if it should come, the most authentic and realistic assumptions available are required. This is so, not only because such planning governs the expenditure of large sums of program funds, but also because the very survival of the nation may depend upon the efficacy of the programs which is in part dependent on the quality of the planning assumptions. In this context the consequences of the assumptions used for planning are so grave that no planner can afford to use anything but the most authentic assumptions he can get.[113]

But this passage also appears to offer a challenge to the rationale of the present volume. How can a generalized outline of the institutional and social structural determinants of social responses to attack assist in the planning of a "program related directly to the mitigation of the effects of any actual attack"?

The answer must lie in the general proposition that before a social variable can be manipulated with analytic precision, the scope, characteristics, and meanings of its domains must be established. It will be impossible to incorporate precisely stated social variables, parameters, and factors into an attack model until the general social dimensions of attack can be individually and collectively established. While certain social sectors can already be described with some precision, especially sub-sectors of the economic system, the social domains and levels of most determinants which will affect responses are in only the first stages of rigorous analysis. The first results of these analyses will be, therefore, to set a number of social domains and institutional and social structural levels for which countermeasure systems have been only barely imagined at present.

In this setting, where basic domains have yet to be firmly established, it would appear to be spurious to try to manipulate precise indicators of all their

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[113] Department of Defense and Office of Emergency Planning, Nuclear Attack Hazard in Continental United States - 1963, Annex A: Background and Procedures for Applications (u) (Washington: Department of Defense and Office of Emergency Planning, Executive Office of the President, March, 1964), p. A-14 (Unclassified).

characteristics. Similarly, in those instances it would be difficult to compute the effects of a range of particular and precisely varied attack patterns. But some notion of attack targeting must underlie any attempt to study the social effects of attack. What kind of assumptions should be used?

Since the analytic task of the studies in this volume has been to establish the basic institutional and social structural dimensions of attack, preparatory to using them to specify attack effects, the basic target which it has been necessary to consider has been nothing less than the totality of organized behavior and social life in American society at its various levels. It has been necessary to consider the whole interacting range of institutions and social structures which forms a complex industrial society. Thus, given the scope and the interrelations of the elements of the potential target, it has been useful to employ the assumption of a massive attack as the upper limiting case of an attack pattern which would be likely to activate the full range of institutional and social structural vulnerabilities in society. While several studies consider the effects of some particular attack targetings,[114] all the chapters of this volume have used a rough model of massive attack against which to consider and define the social dimensions of thermonuclear attack.

The basic attack scenario which has guided these studies assumes that American society is subjected to a bombardment ranging in size between 1,500 megatons as the lower limit and 10,000 megatons as the upper limit.[115] This onslaught occurs over an interval of less than six hours and is not followed by an invasion or by the introduction of other agents, such as chemical and biological weapons. The weapons in the attack pattern are distributed so as to bring the majority of the major metropolitan centers of the United States under direct risk of blast, direct radiation, thermal, and fallout effects; this distribution of risk is in units proportional to the size and importance of each metropolitan area targeted.

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[114] See especially Chapters III and IV, below.

[115] The procedure for outlining a common set of basic attack assumptions to the authors of the studies in Part II is discussed in the Appendix to Chapter I, below.

Simultaneously, half or more of the weapons are directed or could have been directed against the American strategic retaliatory force. It was assumed that the United States made no pre-emptive strike based on intelligence estimates, and that the attack had many features of surprise.

Such an attack scenario is more appropriate to strategic thinking of a few years ago than to the present. On the other hand, its use forces the analyst to confront critical issues which might be muted or deferred if attack scenarios or assumptions of lower scale were used. Included in these issues are such questions as:

> (1) Given a massive stress exerted against the entire social system, what forms of individual and collective behavior may be expected at different times? Under conditions of widespread destruction, death, and stress, will this behavior be adaptive, or will hopeless disarray occur?
>
> (2) What will be the institutional and social structural dimensions which will be crucial in shaping individual and group responses to attacks so large that it can be assumed that all elements of the social system will ultimately be exposed to risks, during and following attack? Under what conditions will these institutional and social structural patterns continue to function?
>
> (3) What are the institutional and social structural criteria for the survival of the society?

As will be evident, however, a certain intellectual price must be paid for the use of this level of scenario.

Massive Attack as an Assumption in Social Science Analysis. In considering the social system as a target of stress in the uncertain future, an assumption that this stress comes in the form of a massive attack focuses the complex descriptive task. By assuming that the stress has a clearly demarcated, sudden beginning and a widespread reach throughout the ecological system and population of the society, the massive attack assumption establishes a relatively fixed point in time for all situations of action in society, from which all social responses and social changes throughout the whole social system originate.[116] In contrast, if it is

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[116] This does not mean, of course, that all systems and sub-systems are simultaneously affected in the same way by attack. See p. 113 above.

assumed that the attack is aimed at only a few areas or is of relatively protracted duration (with somewhat lower weapons yields at any particular point in the attack sequence), then there is the added analytic dilemma of separating the immediate effects of weapons from the mounting sequence of social "multiplier effects". These multiplier effects would result from the increasingly general involvement of the total social system in managing the stress exerted on local areas or through a mounting scale of immediate attack effects. The dilemma would be less severe if the small attack were confined to a few highly critical metropolitan areas (e. g., New York, Chicago, Los Angeles, Washington, D. C.). The problem would then be to trace the patterns of relations between these urban foci and the remainder of the society; although complex in itself and with terrifying implications, the problem would be essentially to trace the institutional and structural patterns which relate these areas to the rest of the society, and to determine how damage to these areas multiplies into the society through these linkages and dependencies. The analytic problem would be much more difficult, however, if it were necessary to consider an attack pattern which gradually mounted over protracted time, especially if the whole society were the ultimate target. Here, immediate damage would be followed by social response, which would be affected in turn by later attack exerted against a society whose individuals, social structure, and institutions had already begun to respond. It would be necessary to unravel a constantly changing sequence and interaction of attack effects and social responses.

The clarity offered by the massive attack scenario depends in part, however, on whether it is analytically feasible to consider the total complex of behaviors, social structures and relations, and institutions in industrial society to be a target. If the metaphor-model of society as an interrelated, interpenetrating group of systems is accurate and useful, then the massive attack can be introduced into this metaphor-model at a point in time, and the resulting possible sequences of interrelated responses can be studied on their different levels. But as later chapters will show, an attack may have variable consequences for different institutional sectors of society. Furthermore, these institutional sectors are understood with varying degrees of precision. It is useful, for example, to compare economic models with demographic models or to compare these models with attempts to

model political processes in society.[117] Constraints on resource allocation in the economy can be described with much more precision, for a greater variety of potential attacks, than can constraints on the vital movements in a population, or constraints on the retention or change of political processes. Under such circumstances, the application of the massive attack scenario to the different crucial institutional sectors will produce estimates of effects which have varying validity and precision. Furthermore, when interactions of effects among institutional sectors are explored as part of a unified model of society, variabilities in the description of individual sectors can introduce a new order of error or uncertainty, which results from combining information with varying reliabilities and degrees of precision.

While well suited to use with the model of the social system developed in this chapter, the massive attack scenario contains elements which appear to be simultaneously too simple and too complex. As an assumption in social science method, the massive attack scenario is too simple, because it establishes at one discrete, limited temporal interval the beginning of social changes, responses, and institutional interactions which ultimately affect all levels of society. To make the most effective use of it, this assumption depends on an adequate, pre-existing model of societal functioning. Conversely, in the absence of such a model the scenario may be too complex an assumption, for it may bring too many institutional and structural features of society into play at once. It may be more feasible to study social damage and social responses in more limited areas, and to trace from them the effects which extend to other arenas and levels of social structure and institution in the larger society.

The basic justification for using such a scenario must be, therefore, that it points up the basic institutional and social structural criteria and domains of

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[117] Attempts to make <u>particular</u> economic forecasts, demographic projections, and pre-election voting polls will reflect the basic models used by the analyst, but will show a different scale of reliabilities. The accessibility and manipulability of sampling data in estimating voting preferences permit more accurate projections than can be supplied for the demographic or economic sectors. While these sectors can marshall more elaborate models for making projections, by the same token their characteristic projections must be subject to many more intervening variables.

responses to attack, not that it is the most efficient way of programming a study of precise attack effects on all social levels.

Massive Attack as an Assumption in National Security Analysis. While sudden, massive attack is a horrifying possibility, it may be less feasible or likely than other potential forms of attack. Changes in deterrent postures among the nuclear nations of the world and other shifts in the environment of national strategic policy have created the need to devote more attention to other forms and gradations of international crisis and conflict.[118] It appears more likely now that even if a sustained international crisis were to evolve to the phase of a massive thermonuclear exchange, the responses of American society to the mounting crisis would create new dispositions and patterns of social characteristics and processes which would shape post-attack responses. It would also appear that a sudden thermonuclear bombardment is now more likely to be the result of an "accident" which could affect relatively small physical areas at the outset. Such an "accident" would not have the magnitude of a massive thermonuclear attack, nor would it necessarily provoke an instantaneous, "spasm" response.

As an assumption from the perspective of national security planning, therefore, the massive attack scenario, standing alone, could guide the study of societal vulnerability in directions which are less important to immediate needs. Given limited research resources, it could be argued that the first emphasis should be on the concrete assessment of particular patterns of damage to the social structure in local areas. It could also be argued that the nature of likely thermonuclear accidents and the increasing need for enemies to aim first at strategic forces in an all-out exchange dictate that primary attention be paid to managing the social effects of fallout and its countermeasures.

A number of arguments in this vein could be adduced. Again, the position taken is that the massive attack scenario is more likely to point up the crucial behavioral and institutional patterns which will affect attack response than is a more limited set of assumptions. As a matter of efficiency in procedure, it may be more useful to confront immediately and directly the problem of specifying the

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[118] See Kahn, op. cit.

crucial domains and variables than to extrapolate upward from limited effects expressed in limited areas of an industrial society. By considering the consequences of a massive attack, the designer of countermeasure systems is more likely to have considered all the relevant domains which will shape attack effects and for which systems must be designed. In the longer run, the use of a massive attack assumption appears more likely to produce a broader range of relevant information, even though in the shorter run, particular requirements for countermeasure system criteria may encourage a more restricted search for knowledge.

Then, too, the national security environment may shift once again. What is now a matter of research efficiency may become a matter of urgent national planning, if those governmental organizations now charged with reducing the social risk from thermonuclear attack are forced to take a new look at the problems of reducing the vulnerability of the whole society.

Organizational Constraints on the Definition and Use of Post-Attack Knowledge

The Official Environment. The analytic use of massive attack assumptions applied to a total description of institutional structure and process in American society emphasizes a striking anomaly which exists in the background of all civil defense analyses --- an anomaly which constrains those who might be expected to have the most urgent uses for knowledge of the post-attack social world. This anomaly is the sharp disparity between the vast social requirements of a comprehensive program to reduce vulnerabilities from a range of possible attack patterns and the actual organizational and material resources which appear to be presently available to meet them. It is partly cause and partly product of the relatively low prestige and fragmentation of those governmental agencies charged with direct responsibility for reducing social vulnerability to thermonuclear attack.

There are two governmental organizations on the Federal level with primary responsibilities for preparing measures to reduce the effects of thermonuclear attack on American society. They are the Office of Civil Defense (OCD), presently located as an adjunct to the Secretary of the Army within the Department of Defense,

and the Office of Emergency Planning (OEP), in the Executive Office of the President.[119] Since their establishment within the Federal Executive Branch, both agencies and their precursors have been through a succession of reorganizations and administrative migrations.[120]

The present placement of these agencies within the Executive Branch resulted from the 1961 decision to divide their immediate parent organization, the Office of Civil and Defense Mobilization (OCDM), which had been an element of the Executive Office of the President. A basic group of planning tasks and immediate decision-making functions in future disasters remained in the Executive Office of the President, as the responsibility of the new Office of Emergency Planning. The Director of OEP inherited the statutory position of the Director of OCDM on the National Security Council. Meanwhile, a new Office of Civil Defense was formed, with potentially very substantial civil defense systems design and operational responsibilities. This organization migrated to the Department of Defense, where it was first given a high-level, semi-independent status under an Assistant Secretary of Defense for Civil Defense. In 1964, however, OCD moved down in the formal Defense hierarchy, becoming an element of the Department of the Army at the level of the Office of the Secretary of the Army. This downward movement was accompanied by an increasing awareness of the scope of the immediate post-attack operational tasks which might confront OCD, and the corresponding need for greater technical and manpower resources with which to meet these tasks. It could not be concluded, therefore, that this downward movement was in any simple sense a direct reflection of the apparent decrease in OCD's ability to be relevant

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[119] Office of the Federal Register, United States Government Organization Manual: 1965-1966 (Washington: U.S. Government Printing Office, 1965), pp. 65-68 and pp. 151-152. The organizational structure reported here was in existence at the time this volume went to press, in early 1966.

[120] In the absence of a comprehensive organizational and institutional history of civil defense matters, the most useful basic summaries of these events and their background will be found in chapters by Herbert Roback ("Organization for Civil Defense") and Neal FitzSimons ("A Brief History of American Civil Defense") in a forthcoming, as yet untitled book on problems of civil defense preparedness, under the editorship of Eugene P. Wigner. Eugene P. Wigner (ed.), _____ (Princeton, N.J.: Princeton University Press, [1967]).

to national security policy at the highest levels. Perhaps more important was the emerging, though diffused, awareness that OCD could conceivably someday have staggering operational responsibilities for housing, feeding, clothing, communications, and transportation. The foundation for meeting these responsibilities could be best laid now by bringing OCD into closer relation with operating and line organizations. Previously, OCD had existed in a staff, planning, and advisory environment, on the assumption that states and local areas would provide primary impetus to civil defense measures.

In preparations for meeting the demands of thermonuclear attack, the special domain of OEP has been to develop plans, criteria, and analytic procedures for allocating and coordinating resources within a damaged economy and governmental system. Occasionally --- as in the Alaska earthquake disaster of March, 1964 --- OEP has had a major opportunity on which to practice its functions as principal coordinator of disaster recovery measures.[121] In contrast, OCD has been charged with primary responsibility for developing and operating systems to protect the American population from the immediate effects of thermonuclear attack. Since 1963, this has meant, in effect, that OCD has been maintaining the gradual development of a public fallout shelter system. Primary emphasis has been upon identifying, marking, and stocking existing spaces and in encouraging the development of emergency warning and emergency operating systems. During the 1966 Fiscal Year, to maintain programs which are intended ultimately to provide protection from thermonuclear attack to two hundred million Americans, OCD had a basic budget of 106.78 million dollars.[122]

There are several striking features to this organizational situation. Most obvious is the paucity of material resources which has been devoted to developing

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[121] See Office of Emergency Planning, Impact of Earthquake of March 27, 1964 Upon the Economy of Alaska (Prepared for Federal Reconstruction and Development Planning Commission) (Washington: Office of Emergency Planning, Executive Office of the President, 1964).

[122] U. S. Department of Defense, 1966 Office of Civil Defense Program Summary: November, 1965 (Washington: Department of Defense, 1965), p. 38. The statements earlier in this paragraph on the substance of the current OCD program are based in part on this reference.

means for protecting not only the individual members of American society but also the conditions for the complex institutional and organizational functioning which maintains a total industrial society and its sectors. A history of decisions to allocate resources to civil defense activities would explain this paucity as a result of a number of basic pressures on the highest levels of decision-making. These pressures include doubts in some quarters of government over the effectiveness of feasible civil defense systems, uncertainties about the meanings which civil defense conveys to potential adversaries, demands for uses of funds in programs which appear to have higher priorities than civil defense, outright opposition to civil defense from articulate minorities, and the preoccupation of the American public with other issues.[123] This continuing paucity has been in ironic counterpoint to the scope of the issues uncovered by any systematic attempt to define the social dimensions of thermonuclear attack.

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[123]It is not possible to present here an account of the interplay of interests and forces which has led to the present relatively dormant, underpublicized civil defense program, even though such an account would be of interest in understanding the total environment in which information about the post-attack social world must be used. Such an account might begin with attempts to initiate a comprehensive shelter program during the Berlin Crisis of 1961. It would examine the alternating emphases followed by the shelter program --- first toward private, home shelters, then toward public shelters. It would analyze the unfolding of issues in the debate over shelters which occurred in the intellectual community in 1961-1962, and it would note how opposition to civil defense entered the intellectual armamentarium of peace action and social protest groups who were pursuing more general objectives. (Vestermark, loc. cit., considers some of the main themes employed by intellectual critics of the shelter program.) It would note the consistent though passive support which the American public has given to shelter programs on many public opinion surveys. (See the studies by Levine and Cole, Berlo et al., and Nehnevajsa, referenced in ibid., pp. 271-272 and p. 286.)

It would devote special attention to the "cost-effectiveness" studies performed on the shelter program in 1963 and later years; these studies led to the statement by Secretary of Defense Robert S. McNamara in 1964 that "Civil Defense is an integral and essential part of our over-all defense posture. I believe it is clear from my discussion of the Strategic Retaliatory and Continental Air and Missile Defense Forces that a well planned and executed nationwide civil defense program centered around fallout shelters would contribute much more, dollar for dollar, to the saving of lives in the event of a nuclear attack upon the United States than any further increases in either of these two programs". (Cited in 1966 Office of Civil Defense Program Summary ..., op. cit., p. 1. These cost-effectiveness studies are reviewed briefly in U. S. Department of Defense, Office of Civil Defense, Fallout Shelter Program: November, 1963 (Washington: Department of Defense,

More important for the present analysis of constraints on the creation and uses of information about possible post-attack social life is the paradoxical situation arising from the division of functions between OEP and OCD. If knowledge of possible post-attack social responses is to be used for designing systems to reduce social damage and ineffective adaptations to thermonuclear attack, then its users must broaden their analytic perspective --- from patterns of damage done to discrete, isolated individuals to patterns of damage and stress in social institutions and organizations. This imposes the ultimate requirement that the civil defense planner and analyst take a society-wide perspective, in recognition of the complex integration of the social life of industrial society. In a way that may be unique in government, the civil defense planner must learn to think in terms of the whole social structure and in terms of complex interactions of social responses within this structure --- even if the final attack should come as an "accident" against an individual metropolitan area and not as a carefully contrived, massive assault on the whole society.[124] Intuitions and suspicions of this requirement have contributed

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(Footnote 123 continued) Office of Civil Defense, 1963).) They formed part of the OCD presentation at one of the most comprehensive official, public reviews of the shelter concept ever undertaken, before Subcommittee No. 3 of the House Committee on Armed Services, under the Chairmanship of Congressman Hébert of Louisiana, in 1963. (See United States House of Representatives, Civil Defense --- Fallout Shelter Program. Hearings before Subcommittee No. 3, Committee on Armed Services, 88th Congress, 1st Session, 1963, Volumes I-IV.)

[124] The only other Executive sector where such a society-wide, total institutional perspective is imposed is in what may be termed the "social welfare" sector --- roughly demarcated by a series of shifting health, education, welfare, labor, and poverty issues. Here, however, "society" has been parceled out into a series of "problem areas", without any real necessity for a final intellectual integration. In the American system of government, this integration comes in the give-and-take of Congressional debate and decision over the President's program and the President's image of society, and in the budgetary process administered by the Bureau of the Budget. The model of society underlying this kind of integration is less a coherent, analytic view of society, more a pragmatic patchwork of elements defined in response to perceived needs and political pressures. While the economic planning done in the Executive Office of the President necessarily concerns the whole society, it is aimed at a society defined primarily in economic terms and dimensions.

The emerging need for an integrated view of society to guide governmental policy lies at the heart of Amitai Etzioni's recent proposal that systems-analysis should be applied to the assessment of domestic problems. He proposes an

to fueling attacks on the shelter program from outside government; it would be interesting to know whether such an awareness has contributed within government to continuing anxieties over the meaning of civil defense programs and countermeasures.

The requirement that the civil defense planner think ultimately in society-wide terms is the basis for the paradox arising from the division of functions between OEP and OCD. If social responses to thermonuclear attack will be the result of social processes on many levels, and if a unified analytic perspective reveals the need for countermeasure systems to protect a complex, interacting variety of institutional sectors, then design and operation of civil defense systems will be the result of an analytic process which begins in the description of many social institutions and social processes, leads to the design of complementary, expensive systems for safeguarding ranges of institutional and individual behavior, and results in operating systems which exist throughout elements of the society and which must be constantly evaluated in terms of the basic analytic perspective on society held by the highest-level planners. In the current framework of American assumptions about what government can and should do, this would be an analytic, design, and operational challenge of the greatest magnitude. But, in conducting tasks which lead ultimately in this direction, OEP has functioned as a head without its body, while OCD has had to function as a body without its head.

OEP's prime responsibility in preparing for a post-attack world has been to establish the basic inventories of data, standards, analytic procedures, and alternate lines of authority which could be used to provide the society with the organizational and material resources required to guide an integrated longer term recovery effort. These inventories of plans and procedures exist at the higher

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(Footnote 124, continued) organization, similar to RAND, which would study "questions that cut across responsibilities of any one Federal agency and examine the effects that programs planned by one agency will have on those of another. It would also ask, using the tools of modern social science, what will be the cumulative effect on our society of increased population, migration to cities, automation, mass education, etc., not independently for each process, as if the others do not exist, but as they work on each other ....". Quoted in American Behavioral Scientist, IX, 6 (February, 1966), p. 33.

levels of government. They have not been converted into a detailed and "hardened" total management system for even the crucial urban centers of the United States, much less for the entire nation. In contrast, OCD's prime responsibility in preparing for a post-attack world has been to provide systems of physical protection which would enable the population to survive in the short run, so that there would be a human base upon which to begin longer term recovery efforts. Fragments of a public fallout shelter system exist at present. Potentially, OCD's mission could require an investment in a nation-wide system of blast and fallout shelters, and a ramifying complex of auxiliary support facilities.

In a sense, then, OEP has the mandate to think about the society, to prepare means for guiding an integrated recovery effort. On the other hand, OCD has the actual survivors of the society under its protection --- these survivors and their supporting material resources must be reassembled from sheltered, fragmented communities following an attack, into an integrated economy and political system. As a consequence, OCD will be directly faced with the problem of protecting the elements of social institutions as well as individual survivors. If OEP is to have something left to manage, OCD must be able to hand over to it the elements of a society. This means that OCD must know what these elements are in order to take measures for their survival, even though the ultimate criteria guiding societal recovery will probably not be in OCD's hands. Thus, part of OCD's "head," guiding its decisions to design systems to protect elements of society and its management of these elements in the short run after attack, exists quite apart from the potentially elaborate OCD body of physical systems and their design. By contrast, OEP's body --- the actual elements of the human society which it must manage --- exists largely apart from its head.[125]

For many foreseeable natural disaster situations, ad hoc and pragmatic adjustments can be worked out for coordinating OEP management functions and OCD protective and nurturance functions. In preparing for the possible effects of thermonuclear attack, however, the existing split in functions between OEP and OCD

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[125]Of course, OEP does manage the Federal emergency resources stockpiling program and a group of rapid computational facilities for damage assessment.

separates many of the potential criteria of system management and system effectiveness from the systems themselves. This means that it has been administratively difficult to take a unified analytic view of the possible interactions which might exist among various sectors of the social system. In turn, this means that it has not been possible to evaluate potential vulnerability reduction systems in the light of their contributions to networks of social responses which may be required to maintain a functioning society or its key components. Instead, intuitively sensible but limited criteria have been used in evaluating such systems as the fallout shelter system. For example, different combinations of fallout shelter, blast shelter, and defensive weapons systems have been evaluated in terms of such "cost-effectiveness" criteria as "number of additional lives saved" or "number of additional lives saved per increment of funds".[126] Saving added numbers of individual lives is intuitively congenial to the American emphasis on the importance of the individual; arraying these additional lives saved against dollar increments injects the flavor of efficient budgeting. But how can the planner know that he has also saved the elements and preconditions for recovery of the social structure? And, what happens if he saves more people than he has inventories to support?

To answer such questions, it is necessary to have an integrated view of what it is that is to be saved, and why. The separation of functions between OEP and OCD tends to divert attention from the development of this integrated view. Instead, OEP develops more limited, albeit complex, economic and administrative criteria for managing broad societal recovery problems. To meet immediate demands, OCD finds immediate ways of deciding how to measure the effectiveness of the limited systems for which it can presently budget. These pressures lead to the fragmentation of the much more comprehensive problem of describing a range of social dimensions and social requirements for viewing possible social responses to thermonuclear attack. An organizational fragmentation becomes an intellectual fragmentation producing an intellectual constraint to which the analyst consciously and unconsciously attends. It forestalls the development of a comprehensive view of societal, institutional, social structural, and individual vulnerability.

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[126] Office of Civil Defense, Fallout Shelter Program: November, 1963, op. cit., especially pp. 8-13.

Organizational Characteristics Which Create Organizational Constraints. Even if OEP and OCD were reunited in an effective organization with comprehensive powers to plan, design, and operate a host of vulnerability reduction and recovery management systems, a number of traits found in any organization would constrain the development and use of a body of knowledge concerning post-attack social effects.[127] These traits result from basic structural and functional properties of organization in its various forms.

A concrete social organization is a body of individuals organized to achieve particular goals. To achieve these goals, the organization does many things which contribute to creating the conditions to achieve these goals but which do not appear at the final point when the goals are realized. An organization must maintain its own internal coherence of structure, it must develop means for looking ahead and anticipating future goals and situational requirements, it must provide for at least some of the personal needs of its members, and it must be responsive to its "environment", particularly when meeting the demands of this environment is one of its formally stated goals.

Organizations may be ordered on one of several basic principles, but the study of constraints imposed by governmental and administrative organizations requires special attention to the structure of the bureaucratic form of organization.[128]

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[127] It must be emphasized here that the point of the preceding discussion of the separation of functions between OCD and OEP was to outline the way in which this separation created an intellectual constraint, on the development of adequate models and knowledge. It does not necessarily follow, therefore, that if OCD and OEP were to be recombined and strengthened, the new organization would function with all the effectiveness for which planners might yearn. There is a certain danger that in creating a unified, administratively powerful organization, planners will think they can actually strictly determine events right down to the situation of action in all cases. It is probable that all the organization can and should do is to try to identify and preserve the conditions for institutional functioning and effective personal behavior, then leave events to the working of the "social marketplace". Sidney Winter considers the economic aspects of this problem of levels of effective control in Ch. IV, below, especially pp. 422-434.

[128] On the characteristics of the bureaucratic organizational form, perhaps the classic definition is provided by Max Weber in his essay on "Bureaucracy". Max Weber, From Max Weber: Essays in Sociology, trans., ed., with intro. by H. H. Gerth and C. Wright Mills (New York: Oxford University Press, 1946), Ch.

Particularly as a set of potential constraints on developing knowledge needed by the organization, the bureaucratic form has several distinctive and important characteristics.[129] A bureaucratic organization is, first, a hierarchy of superordinate and subordinate authority and functions, established according to stable, rationalized regulations which attach specific responsibilities, rights, and duties to concrete organizational roles which are occupied by specific, formally qualified individuals. This hierarchy exists in order to carry out tasks instrumental to achieving the goals of the organization. The final goals of the organization may be expressed in terms of the particular "products" it produces. One kind of bureaucratic organization may produce specific, visible commodities, which can be consumed or which enter another stream of production moving toward final demand. More generally, however, this organization and its products may meet general requirements of maintaining a given category of economic production, within a larger set of societal functions. Another form of bureaucracy may produce services. These services may range from specific meeting of an individual's needs --- for haircuts, legal advice, social welfare aid --- to general functions, such as the planning and direction provided by government agencies.

A bureaucratic organization is pre-eminently directed toward specific, definable goals and products, and it is organized around the interdependent set of functions required to achieve these goals and produce these products. As an organizational form, it stands in marked contrast to an organization such as a fundamentalist religious sect. The goal of the sect comes from the fact of participation by

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(Footnote 128, continued) VIII, "Bureaucracy", pp. 196-244. For classic distinctions on the types of authority governing social organization on several levels, see Max Weber, The Theory of Social and Economic Organization, trans. and ed. by A. M. Henderson and Talcott Parsons, with intro. by Talcott Parsons (New York: Oxford University Press, 1947), pp. 324-423. The functioning of the bureaucratic model in practice leads to pressures to modify the bureaucratic model, as administrators know. See Peter M. Blau, The Dynamics of Bureaucracy: A Study of Interpersonal Relations in Two Governmental Agencies (Chicago: University of Chicago Press, 1955) and Chester I. Barnard, The Functions of the Executive (Cambridge: Harvard University Press, 1964 - Sixteenth Printing). Also see Robert K. Merton et al., Reader in Bureaucracy (Glencoe, Ill.: The Free Press, 1952).

[129] This discussion is a synthesis and extension of some of the principal themes in the references in Footnote 128, above.

individual members. Maintaining this participation, which leads to a direct experience of fellowship with like-minded believers and an exalting sense of communion with the supernatural, is itself the primary goal of the sect as an organization. The "product" of this participation is an inner state of grace, unique to the person, non-negotiable, and an end in itself. In achieving this grace and exaltation, all members are equal --- in marked contradiction to bureaucratic formalism, the sectarian of lowliest background and status may prove to be the most "blessed" in the organization, in spite of what may be his total inability to contribute to the sect as a form of social organization. Because of the ultimate values of grace and exaltation, and because grace may come to all members, all members of the sect are equal. Authority and formal organization are transitory and improvised, often residing only in a charismatic leader or a priesthood of shifting membership. Over time and in response to situational pressures, some sects may convert themselves into more coherent churches, by seeking a stable, disciplined, bureaucratic form of organization to meet intermediate functions and goals. As long as grace and individual exaltation remain paramount and highly individualized "products", however, the emerging church will be torn between the demands of egalitarian fellowship as a setting for individual grace and the demands of maintaining bureaucratic coherence.

From one perspective, the bureaucratic organizational form is an administrative arrangement for providing rationalized continuities in meeting the demands of a complex and ambiguous environment. In government, personnel may come and go, programs may shift their emphases, and resources available for meeting the missions of government may expand or contract. Through it all, the bureaucratic form of organization enables a particular agency to pursue a succession of goals and products. As personnel come and go, they must meet rationalized standards of recruitment and job performance, even though informal political processes may come to dominate particular sectors of an agency. As resources and goals shift, policy and leadership elements in the bureaucracy restate organizational procedures within a basic framework of administrative law and usage. Sometimes in conjunction with even higher levels of leadership, sometimes acting only on the basis of sufficient authority internal to the agency, the leadership may redefine and rearrange

the functions necessary to achieve the performances which are required in attaining agency goals. This leads to new patterns of structural differentiation within the agency, so that workers can exist in sub-units rationalized according to the function these units contribute to larger patterns of agency performance.

Short of stating a formal model of general bureaucratic functioning, enough may have been said here to indicate that bureaucracy appears to have many of the features of a society, as society was described earlier in this chapter.[130] As does society, a bureaucracy has functional components which meet problems of maintaining the general, continuing patterns of the bureaucratic agency and of reinterpreting agency structure in terms of shifting demands and intermediate goals. This pattern maintenance function is met, at the highest level of the agency, by its policy-making and leadership element. These individuals specialize in maintaining the internal order of the agency, as it must perform and produce. They must be the sources of structural innovations which permit the continuity of the agency as the agency produces to meet evolving goals. Below the policy-makers and bureaucratic leaders and closer to the immediate "situation of action" with which the agency must contend in order to meet its goals and produce its products are administrative and operational officials. These individuals are in immediate charge of "production" and performance. On them depends the interacting pattern of adaptive functions which must be met if resources and personnel are to be combined to meet requirements for agency outputs. Under them may be many line operatives, engaged in actual services or tangible production. These outputs are produced and sent out into a complex social and physical environment which utilizes the outputs and sets shifting patterns of demands for new outputs. Analytically, a bureaucracy can be differentiated into two broad layers. One layer, preoccupied with functions of maintaining organizational direction, continuity, and coherence, is the layer of the higher policy-maker and administrator. The other and lower status layer, concerned with making internal-to-organization and external-to-organization adaptations to resources, personnel, and the total "situation" of the organization, is the layer of administrator-operative and immediate operator. In manifesting

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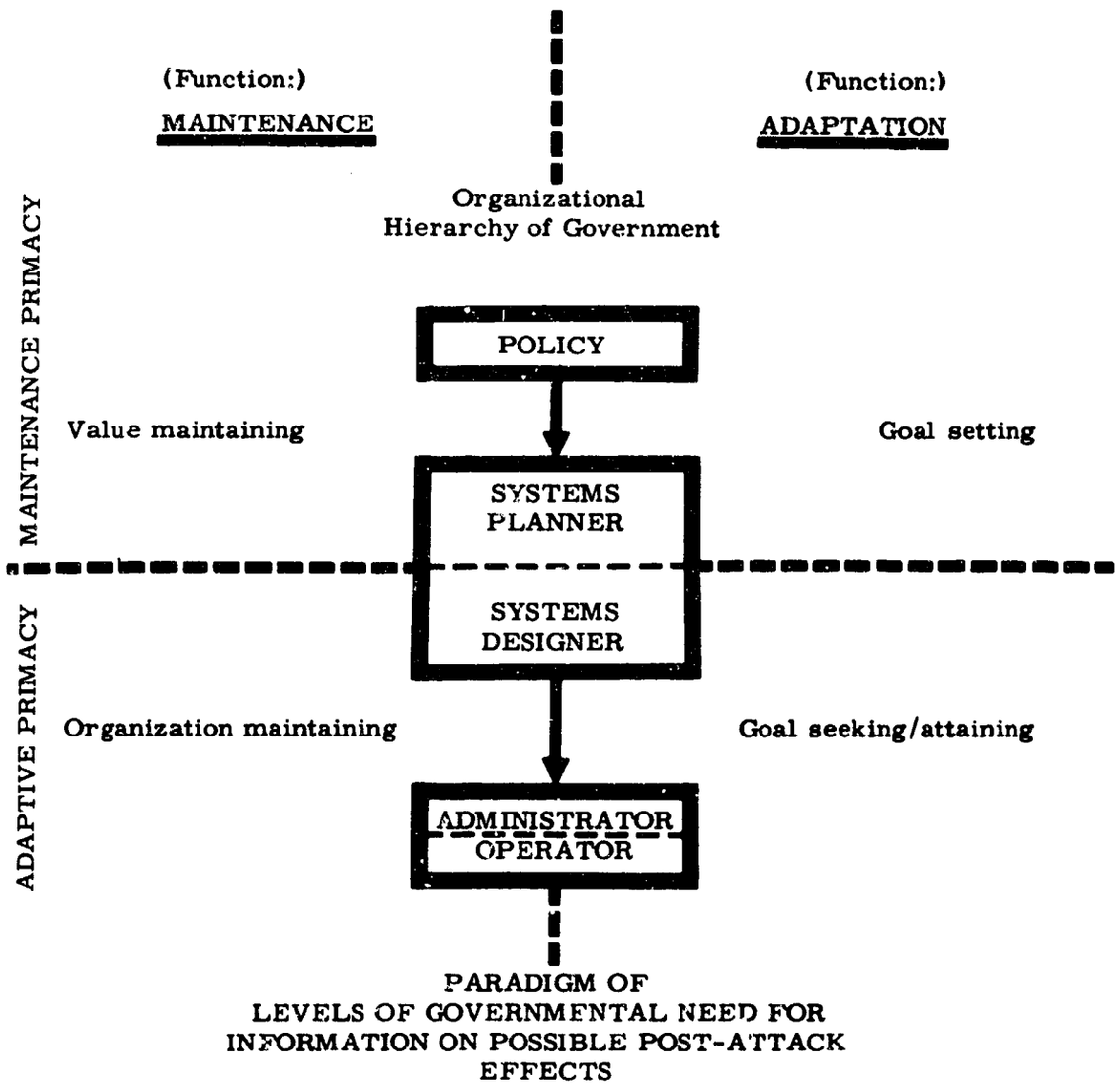
[130] Cf. especially pp. 103-122, above.

these patterns of complementary functional differentiation and organization, a bureaucracy in both the abstract and in practice is revealed to be a social system.

This simple stratification of a bureaucracy into two layers is not sufficient, however, to account for all the functional problems of a bureaucratic agency. Within the higher status, pattern-maintaining functional layer of policy-makers and higher executives, there are constant needs to develop broad patterns of adaptation, so that the organization can meet new requirements. On this upper layer of bureaucratic organization, the adaptation is made by defining new goals, within the alternatives which only higher policy-makers can know exist. Thus, the key adaptive function at this level is to maintain organization values and patterns while defining new goals which can form viable ranges of performances at the lower, operational level of the organization. At the policy level, goals and programs are set --- but within the requirement to maintain the internal coherence of the organization and the total functions which the organization may perform within a larger administrative system. Conversely, in the lower layer of bureaucratic organization, administrators and operators with immediate, adaptive concerns must seek and attain particular organizational goals through effective performances, while acting so as to maintain the organization to meet future performance requirements. This is reflected in the existence within the lower layer of "staff and support" elements, charged with meeting the needs of line operatives internally to the agency. It is also reflected in the ranges of structure within which the line operative must perform to meet his adaptive, performance-producing and goal-attaining requirements. These structures have legal and customary roots, and the line operative must act within the broad limits set by them if he and his subordinate workers are to be carrying out their roles in "legitimate" ways. Thus, at the level of operations and immediate adaptations, administrators and workers must act to maintain the organization. Furthermore, they must have their support needs met by lower level units which function to maintain the capacity of line operatives to function in coherent and consistent ways. In short, the process of adaptation and production has its own immediate requirements for pattern maintenance.

As is shown in the simplified model depicted in Figure I-10, (p. 167), the structure of authority in a bureaucratic organization can be differentiated along two

Figure I-10


(Function:)
MAINTENANCE
(Function:)
ADAPTATION
Organizational
Hierarchy of Government
MAINTENANCE PRIMACY
POLICY
Value maintaining
Goal setting
SYSTEMS
PLANNER
SYSTEMS
DESIGNER
ADAPTIVE PRIMACY
Organization maintaining
Goal seeking/attaining
ADMINISTRATOR
OPERATOR
PARADIGM OF
LEVELS OF GOVERNMENTAL NEED FOR
INFORMATION ON POSSIBLE POST-ATTACK
EFFECTS

axes. One axis, the horizontal axis in Figure I-10, divides the organization into degrees of relative concern with pattern maintenance or adaptive functions. The upper layer of the policy-maker is primarily that of maintaining the organizational pattern and directing the total functioning of the organization as a coherent system. The lower layer of the administrator-operative is, on the other hand, the locus of adapting in ways required to meet organizational goals. The other axis, the vertical axis in Figure I-10, cross-cuts the axis of relative functional primacy in the organizational hierarchy. It splits both major organizational layers into the principal, complementary functional problems which center within each layer. For the higher-status layer of policy and executive administration, the maintenance problem is one of maintaining basic values, mandates, and programs. For the lower-status layer, the maintenance problem is maintaining the organizational structure and its viability in the face of immediate or longer term adaptive demands. On the other side of the vertical axis, within the higher-status layer, the principal adaptive problem is that of goal-setting, in response to new requirements defined in the context of the basic values, mandates, and programs of the organization. Such requirements may come from within the organization, if it has been granted the requisite autonomy, but in the classic bureaucratic setting, they are more likely to come from outside. In either case, the basic organizational pattern must be maintained within minimum ranges. For the lower-status layer, the principal adaptive problem is the actual conduct of the functions which will lead to performances that meet goals.

It should be emphasized, therefore, that both axes of Figure I-10 are based on the distinction between "maintenance" and "adaptive" functions. But where the horizontal axis divides maintenance and adaptation as relative emphases of concern within one layer compared to another, the vertical axis divides the organization, by layer, into sectors of complementary maintenance and adaptive problems. The existence of complementary functional problems within layers and between layers of a bureaucratic hierarchy is a major characteristic of the bureaucracy as a social system. Each of these problems requires an organizational solution, expressed in the differentiation of functions and organizational structure within a particular organizational layer. These organizational solutions to functional

problems will have effects felt throughout the social system formed by the agency. For any agency, these functional problems and their effects in creating organizational components to meet them set basic limits within which its structure can evolve and within which its office-holders and workers can do their jobs.

This elementary functional model of a bureaucracy is especially appropriate for describing agency structure and process in implementing a program which already exists in full detail. The special structural dilemma of an agency which must plan, build, and someday operate civil defense systems is, however, that it must function in the present time within a bureaucratic form which permits it to develop programs which will be neither completed as static systems nor subjected to full operational test in the easily foreseeable future. Particularly if civil defense goals are based on a comprehensive view of the interdependence of social institutions in a complex social system, the civil defense policy-maker will find himself in urgent need of an acceptable description of society which can be translated into a statement of the key sectors which civil defense systems should protect. At the same time, the policy-maker will be confronted with the fact that he cannot easily subject his notions of what might be critical sectors to protect to definitive empirical test. At the lower end of the civil defense hierarchy, the operator will want to know the conditions under which civil defense will and will not work, and what to do to foster or control these conditions. Again, in order to find out, he cannot subject systems that are abuilding to full test. He must resort to other analytic techniques, based in part upon credible inferences and simulations. Both the policy-maker's and the operator's uncertainties must be managed within a bureaucratic organizational framework. Independently of the particular content of civil defense programs, this framework acts to guide the development and use of particular items of information which civil defense officials feel they need. To understand more clearly how this may happen, it is necessary to consider the special interstitial role which systems planning and design responsibilities have in the functional hierarchy of a bureaucracy. This interstitial role intensifies the special uncertainties introduced by the requirement to plan, build, and operate civil defense systems.

An agency with large-scale systems planning and design responsibilities has built into it an organizational pressure toward fusing and confusing the level of policy and the level of operations and daily administration. Systems which will largely exist and operate in the future must meet needs and definitions of the future which are defined from the vantage point of the policy-maker. Only at the policy level is it possible to define the desirable states of the future for which planning must be done now, what resources can be allocated toward planning and building these systems, and what relations these future systems should have to other programs outside as well as inside the agency. But, future systems operating in a future world will be subject to operational problems, the close analogues of which administrators and operators will feel they have experienced. As these officials of the lower bureaucratic level are acquainted with projected new systems, they will interject critiques of design features, based on their experience with actual operations. Where they may not have relevant direct experience, they may nevertheless sense that more information is needed to dispell uncertainties about the probable practical operations of a system feature.

The requirements and pressures generated at both ends of the bureaucratic hierarchy converge on that component of the agency which has specific responsibilities for future systems. While the actual organizational placement of this component may be somewhat different, its functional placement in the bureaucratic hierarchy is as shown in Figure 1-10. The paradox of planning future systems is illustrated by this functional placement, astride the boundary between concern with maintenance and concern with adaptation. Systems design is simultaneously a translation of policy definitions and requirements into concrete operating systems and the design and construction of these operating systems according to the requirements of operating in the real world. Insofar as future system functions are direct translations of policy-maker's definitions, requirements, and assessments, they are products of officials performing primarily maintenance functions, for the agency itself and, in certain instances, for the administrative world of which the agency is a part. But insofar as future system functions are based on requirements for meeting operational needs as they have been experienced, they will reflect the experience of officials performing primarily adaptive functions. In general, when

future systems are being projected as the translation of policy definitions and requirements, it can be said that they are the product of systems planning, done by systems planners. On the other hand, when future systems are being projected within a framework of operational or immediately empirical knowledge and experience, they are subject to the closer constraints of actual design, in the process of systems design, done by the systems designer. Planners and designers are often the same individuals, playing alternating roles. Whether the same or different individuals and agency components are involved, the projection of future systems remains a dual, somewhat paradoxical process: Real systems are based on values and projections of the future, while the guiding definitions of present values and future realities which are to be expressed in future, real systems are themselves modified by knowledge gained from current operations and current scrutiny of the real world. In this process, maintenance and adaptive functions within an agency meet in the borderland of systems planning-systems design.

Future-oriented agencies must manage this convergence of functions at the level of systems planning and design. In an agency charged with planning, designing, building, and operating civil defense systems, this convergence creates special constraints on the use of knowledge about possible social effects of thermonuclear attack. As a general model of the place of systems planning and design functions in an organizational hierarchy, Figure I-10 is also a model of the basic levels at which a civil defense agency has needs for information about the post-attack world.[131] An analysis of the uses of post-attack knowledge in terms of this model will suggest some of the principal confusions and conflicts which the special uncertainties in post-attack knowledge can create for its official users at different levels of an agency.

Consider once more the finding on panic: Except under limited, specifiable conditions, mass panic is unlikely following a thermonuclear attack. To both the

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[131] Figure I-10 reflects especially the functional relations in managing the responsibilities of the Office of Civil Defense at the Federal level. It is less appropriate to describing the Office of Emergency Planning, but it is perhaps most appropriate to a comprehensive civil defense planning and operating organization which would combine the responsibilities of OCD with those of OEP. Even so, the Figure is a model of broad functional relations, not a table of the organizational hierarchy that would necessarily govern a combined organization.

policy-maker and the operationally oriented official, such a finding may be profoundly reassuring. To the policy-maker, it may form part of the answer to alarmist critics of the feasibility of post-attack systems for managing people. The policy-maker may go farther, and see in this finding grounds for assuming that panic will not be a serious problem, and that it is therefore not a part of the post-attack world toward which his agency will need to respond or about which it needs to think seriously. For the operator, the finding may be used to reassure doubters whom he needs to recruit to civil defense operations and who are bothered by fantasies of post-attack pandemonium. If he is familiar in a rough way with the conditions which create panic, the operator may even be ready to do his part to avoid creating them. If he expects field responsibility after an attack, he may make a little check list, of handy points on how to avoid panic.

Yet, the finding on panic remains a peculiarly negative finding. After the initial "Aha!" of reassurance to policy-maker and operator, how is the finding to be used by them? To answer this question, it is crucial to consider the dual function which the negative finding on panic can have. For the policy-maker as well as for the operator, the finding that panic is unlikely makes its initial impact by contradicting doubts which they themselves as well as others may have about the myth of pandemonium; it performs a "myth-busting" role. This role differs from another function which the finding on panic can have. Insofar as this finding can be broken down into a series of sub-propositions which precisely specify the conditions associated with panic outbreaks, it is a shorthand summation of a series of positive propositions which, taken together, describe conditions under which panic can and cannot be expected. The panic finding functions as a statement of "additive knowledge". "Additive knowledge" is a group of cumulative items --- propositions, observations, anecdotes --- which increasingly specifies the precise conditions and characteristics of empirically observable or predictable events. As a summary proposition for a small domain of additive knowledge, the finding on panic describes events which have occurred and, by outlining their conditions, specifies their likely patterns of future occurrence.

The difficulty of testing propositions about the post-attack world reinforces the uncertainties and anxieties evoked by attempts to think about it and plan for it,

to predispose many users of post-attack knowledge to fix on the myth-busting functions of propositions about post-attack society. The finding that panic is unlikely challenges the ugly myth of post-attack pandemonium. Other, positively stated propositions can have a similar myth-busting function. Two complementary findings on food and other consumer supplies form a case in point. First, current levels of per capita consumption in the population appear to be far in excess of those levels which were required to support the standards of living which existed in America at several earlier times in the present century. Second, because of this "excess" in consumption over subsistence requirements, losses from a number of feasible forms of attack would do little more than reduce per capita consumables to levels which were entirely acceptable earlier in the century.[132] Assuming that under the pressure of emergency conditions the public would come to accept this lowering of per capita consumption to a level still within a "living" range, then there is a basis upon which to evaluate myths and worries about "starvation" after attack.[133] Quite concrete, corollary findings can have these same myth-busting functions. For example, for those wrestling with worries about whether an attack in dead of winter would lead to massive starvation because of the inability of the population to grow food, it may be moderately reassuring to learn that in many areas of the country, basic food supplies at processors and in storage tend to peak in the month of January.[134]

But agency programs cannot be built on broken myths alone, even though myth-busting may free the agency to develop programs with less harassment. Myth-busting performs maintenance functions for both the policy-making and operating

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[132] See Footnote 112, p. 145, above, and Ch. IV, below, for the documentation of these findings.

[133] Of course, this evaluation would recognize that under attack targetings designed to maximize population survival, there might, indeed, be critical food shortages. Furthermore, these findings do not imply that individuals would happily accept this reduction in consumption --- only that in a larger range of cases than is frequently realized, people will not starve.

[134] U. S. Department of Agriculture Economic Research Service, Food Supplies Available by Counties in Case of a National Emergency: A Civil Defense Study (Agricultural Economic Report No. 57, July, 1964) (Washington: U. S. Government Printing Office, 1964), especially pp. 8-9.

level of the agency; by reducing anxiety and harassment, myth-busting helps maintain the general viability as well as increase the specific credibility of the agency and its programs. Until they can be translated into additive knowledge, however, myth-busting propositions cannot form the descriptions of present and likely conditions of the real world upon which requirements for adaptive agency action and programs can be based. They remain essentially negative propositions, and without analytic integration.

It is at this point that agency structure reinforces the uncertainties inherent in post-attack knowledge to produce conflicts in creating a stable organizational location for the development of post-attack knowledge. Both policy-making and operational levels of an agency must function in the present time, although both levels construct estimates of the future based on present experience. Where the planning and design function becomes increasingly important in an agency, accurate statements about the future of the agency, its programs, and its operating environment increase proportionately in importance. The systems planning level must receive the policy-maker's interpretations of values, his images of the future, and his assessments of the present, in a form which describes the kind of future world which is to be expected and desired. Complementing the systems planning function, the systems designer must receive from administrators and operators experience from present operations, evaluations of future problems in operations, and estimates of whether planned systems will work and will fit into present systems and operations. In knowledge of the post-attack world, however, both policy-makers and administrator-operators are limited in what they can supply the systems planner and designer. The inaccessibility and uncertainty of the post-attack future and the potentially all-encompassing view of its social life which must be provided leave both policy-makers and administrator-operators unable to give systems planners and designers a complete view of the social reality for which they must plan. Myth-busting propositions, based in both policy-making and operating experience, are insufficient, and the additive knowledge possessed at these levels will be inherently incomplete. The real locus for developing methods to portray the post-attack world therefore shifts to the level of systems planning and design. The mandate to develop systems requires a rationale for describing the ways in which these

systems will exist and function to control events in an uncertain future. Without some model of the future to underly the development of systems, it is impossible to specify the dimensions within which systems will function and the effects they can be predicted to have. In the absence of a coherent analytic view of the total post-attack future at the levels of policy or operations, systems planners and designers are forced to become proprietors of the agency's most complete view of the total post-attack social world.

The relative freedom of the system planner and designer to look at the future contrasts with the need for policy-makers and administrator-operators to be guided by present needs of the agency and conservative, present-reality based estimates of future operations. The policy-maker can settle any conflict here by insisting on a narrow definition of the agency's mission.[135] Thus, the decision can be made to continue development of a fallout shelter program, so that a certain number of spaces are added each year, independently of any other requirement for civil defense that might exist. The policy-maker's problem increases to the extent that he comes to believe that one civil defense system cannot exist alone, but only in interaction with other systems in a post-attack world of interacting determinants of response. Granted that food supplies may exist in the food storage and processing systems of the country --- can the policy-maker be sure that people can get to them? The systems planner and designer will point to the dependency of particularly metropolitan populations upon systems of transportation and distribution to get this food. The planner and designer will back up this proposition with a present-time description of the key communication and transportation processes and links which control distribution in an industrial economy. Should civil defense then be concerned with protecting sectors of this distribution system? If so, how would it do so? In view of OEP's post-attack economic management responsibilities, however, would it even be legitimate for the civil defense policy-maker and planner to think in this direction?

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[135] Sometimes this may be settled for him, by even higher authority outside the agency.

While the policy-maker and the administrator-operator are reacting to present constraints on agency functioning, the systems planner and designer are building what is potentially an additive store of knowledge on the key institutional configurations which will guide vulnerability reduction measures. The systems development level of the organization necessarily turns toward a view of total societal functioning which is denied higher and lower functional levels in the agency. How these levels of the agency legitimize and use this store of additive knowledge will determine ultimately whether the agency obtains a comprehensive and meaningful view of the post-attack social world. A permanently restricted definition of agency mission at the policy level, or an insistence that the picture of total society governing a definition of th post-attack world conform precisely to lessons learned from operations, creates a dilemma for the analyst of post-attack society. He can settle for building limited generalizations into a small body of additive knowledge: the busting of the panic myth leads to a series of propositions about how to avoid designing features conducive to panic into present "hardware systems", so that people in queues will not become panicky; the busting of the starvation fantasy for a range of possible attacks leads to a description of places around the country where food supplies might exist after attack. On the other hand, the post-attack analyst may insist that the complex workings of contemporary society require a more complete view of the institutional and social structural dimensions of societal vulnerability. Such a more complete view can lead toward the development of a total framework for assessing the social effects of present systems and for pointing to domains which new systems must protect.

If he takes this view, the planner and designer finds himself subject to a basic, continuing conflict between his administrative and his intellectual role. Administratively, the developer and user of post-attack knowledge who takes a comprehensive view of society creates a pressure toward what may be an unacceptable broadening of his agency's role. Intellectually, however, the demands of speculating about the post-attack world are such, that without this comprehensive view of the interplay of social determinants and responses, the meaning of the whole attempt to think about the social effects of thermonuclear attack comes into fundamental question.

The analyst who recognizes this administrative danger in his intellectual tools has a difficult dilemma in determining where duty lies, especially if higher agency levels are sensitive to the danger. If the post-attack analyst finds himself in an administrative environment where a highly restrictive definition of agency mission prevails, he is likely to find that the little cues and rewards which tell him how well he has done his job guide him away from the full use of his most powerful tools. Instead, in his more concrete role he may find himself asked merely to be a social technician on new systems. In his more speculative role, he will find himself encouraged to be a minstrel of reassurance and a breaker of myths.

The Social System as Criterion

In National Security Analysis. This volume is directed especially toward those who must provide the intellectual basis for planning complex national security systems. Even more than the analysis of the social consequences of thermonuclear war, the theme of this chapter has been the ways in which models can structure analyses of problems. This larger theme stems from two fundamental orders of uncertainty: the difficulties of extrapolating from existing social experience with thermonuclear weapons and the conceptual difficulties in describing --- much less predicting --- events in complex social systems. National security planners must design systems to control events which have never been fully experienced. In doing this, they must rely partially on analytic tools which are themselves the products of a social science which is still in development.

These analytic issues need never arise, of course, if at the highest levels of policy, the decision is made to defer planning a full range of measures to reduce societal vulnerability to thermonuclear war. A decision to pursue a limited, gradually developing fallout shelter program in effect defers this larger planning task and the pressures which would be generated by it. It does this by providing a set of limited, self-contained criteria by which progress in achieving fallout shelter space can be measured. For each year's effort in developing the program, the criterion of success is simply whether a given number of spaces have come "into being". Program success is measured by increments to the existing number of shelter spaces. If "shelter space" is defined to include a short term supply of

food and water as well as a physical location for adequately housing and shielding one individual, then very specific criteria for measuring increments can be used to evaluate the status of each year's effort. Planners need never look beyond their working definitions of shelter spaces and immediate support systems in order to test whether they have a viable shelter program. By definition, a shelter program exists when there are a certain number of shelter spaces, and when this number of spaces is growing according to standard criteria.

Any analytic attempt to consider interacting patterns of social requirements to preserve individual lives and to reconstitute society immediately exerts pressures to change the dimensions of the criteria by which civil defense programs will be measured. Increments to, for example, a fallout shelter system are no longer sufficient. Instead, new questions arise. How does the shelter capacity in being contribute to the survival of individual and collective abilities for social construction after attack? What links must exist among shelter locations, to meet intermediate range subsistence requirements, if people are living in shelters instead of homes as they weather a long term crisis before attack or rebuild a society after attack? What demographic characteristics of a shelter population will provide indications to administrators that the society which emerges from shelters will have special problems and special needs in preserving valued pre-attack institutional patterns?

Such questions have become the focus of both scientific analysis and raging polemic in the years since thermonuclear weapons became a hazard. Analysts of national security systems and plans have had difficulty in supplying answers to such questions because they have been unable to find institutional and intellectual bases from which to broaden the criteria which they must use in evaluating the existence and potential effectiveness of vulnerability reduction systems. In the end, to answer these and other questions, it must be possible to examine the effects of vulnerability reduction systems on the whole social system of society, now and in the future. In other words, the whole social system, in its pre-attack and post-attack states, is the ultimate criterion for assessing the effectiveness of vulnerability reduction systems.

Taking the social system as a criterion of systems effectiveness is a task of formidable complexity.[136] The vast analytic and intellectual problems --- themselves at the heart of developing a meaningful science of society --- are reinforced by organizational, institutional, and political issues which arise when this criterion is used. Analysts, planners, and designers now must measure the effectiveness of national security programs in terms of their effects on the whole society. The effects of programs on social sectors must be estimated within a meaningful model of the society, whether the program is one for protecting critical metropolitan areas against thermonuclear "accidents" or "symbolic gestures", or one for enabling the whole social structure to withstand a large attack. Merely to provide an organizational home for such analytic techniques will be a profound challenge, for any component of government presiding over such analytic techniques will have unusual powers. Effective ways of making the social system a criterion for national security policies and programs will provide their users with abilities to assess the effects of government programs on total processes of social change. These techniques will have a general utility throughout government, and they will be eagerly grasped by those who wish to see more effective approaches to the management of social change in industrial society. At the same time, effective ways of making the social system a criterion may evoke fears and suspicion inside and outside government. At the heart of political conflicts over the future shape of American society are differing images of what the society is now. The particular view of society which supports the social system as a planning criterion may be assailed by those who argue that it does not allow for their definitions and dreams. Particularly from outside government may come the charge that to employ a social system criterion is to edge toward "socialism" or "centralism" in ways inimical to American pluralism.[137]

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[136] This problem is one of the sociological equivalents of the economic problems for which Hitch and McKean, op. cit., developed analytic tools. It would appear, however, that the task of developing equivalent tools to deal with these sociological problems of national security policy is more difficult, by several orders of magnitude.

[137] This charge by no means exhausts the charges that can be made. Reactions to particular definitions of the social system criterion can be based on other, competing views of the social system. See Horowitz' critique of current social

For the analyst of national security problems and systems, then, thermonuclear attack and the design of systems to reduce its social effects raise the problem of using the social system as criterion. Deciding on meaningful techniques for doing this and placing these techniques within pre-existing analytic and administrative frameworks will be major challenges to those who must project the requirements of future systems for reducing social vulnerability.

In Social Science Analysis. If national security analysts must use the social system as a criterion, then social scientists must understand the social system as a criterion. While the broadening scope of vulnerability reduction planning creates the need for this criterion, the social sciences must supply many of the final meanings the criterion will have. Upon these meanings will depend the definitions of vulnerability and recovery guiding the development of particular national security plans.

In exploring social vulnerability and recovery as analytic problems, this chapter has sought to provide the elements of a general statement of what it is that is vulnerable and what it is that may recover. Through a mixture of metaphor, model, and simple description, the chapter has suggested the outlines of behavioral ordering in society. The problem of determining the crucial levels of behavioral ordering has been focused downward from the level of the whole society and generalized upward from the atomistic individual, to center on the analysis of the kinds

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(Footnote 137, continued) models employed in strategic analysis. Irving L. Horowitz, The War Game: Studies of the New Civilian Militarists (New York: Ballantine Books, Inc., 1963).

An atemporal, structuralist view of society may be particularly adaptable for many criterion purposes, particularly the assessment of the impacts of programs and systems on presently existing institutions and features of the social structure. For other purposes, a view oriented explicitly toward describing processes of social change might be a more meaningful base for the social system criterion. The view of the social system held by "apolitical analysts" may be subject to unconscious ideological themes and pressures which lend special support to the final criterion or criteria of social system states which these analysts use. Mills' critique of an earlier generation of social analysts is still stimulating on this point; see C. Wright Mills, "The Professional Ideology of Social Pathologists", American Journal of Sociology, XLIX, 2 (September, 1943), pp. 165-180. And see Francis X. Sutton et al., The American Business Creed (Cambridge: Harvard University Press, 1956) and Winston White, op. cit.

of analytic relations and causal interdependencies which exist among institutions, social structure, and social systems in their several meanings. The result of this analysis has been to suggest that to understand how the general social system of society is vulnerable, it is necessary to consider the particular ways in which institutional patterns and elements of the social structure may be vulnerable. Social institutions and patterns of social structure appear as the crucial analytic levels on which the structure, processes, and final states of the social system as criterion will depend.

The very ambiguities and uncertainties in post-attack planning which make a model of social structure and social system so necessary to coherent thought also emphasize rigidities and incompleteness in this model. The use of a model of social structure and social system in this setting is an analytic compromise: In the absence of directly validating experiences of the post-attack world, the model functions as a device for projecting the central features of present society forward into time, and for subjecting these features to analytic manipulation beginning with assumed general magnitudes of thermonuclear attack. The model must be an analytic simplification of present-time social structure, function, and process. In a present-time context, however, the model is constantly subject to formal and informal validating pressures from those familiar with the immediate details of the empirical world from which it is abstracted. When projected into future-time following thermonuclear attack, the model emerges with greater clarity as a self-contained system of abstractions. Since the analyst's view of the empirical world of this future is at least partially a product of the definition imposed by the model, it may not contain the full range of dissonances required to challenge and refine the model. Instead, the future may exhibit symmetries and order which are functions of the model, but which the analyst cannot penetrate because he has available no other way of organizing this complex future domain of behavioral events. The analyst may be in the vexing position of distrusting this order and symmetry, but of being blocked from challenging these characteristics without shifting the analytic components of the model.

Research on the post-attack social world therefore magnifies the dilemmas imposed in using models of social structure and social institutions to state a social

system criterion for designing national security systems. In the analysis of present-time society, such a model is an analytic simplification, for ordering complex domains of present-time data. But the dangers of false simplicity and premature analytic closure can be confronted through tests based on examinations of social processes observable in the present time and in the accessible future. Here there is a relatively clear set of procedures for resolving the dilemma imposed by the purchase of analytic order at the expense of simplification. In analyses of the present and accessible future, the domains of reality revealed by the use of descriptive models and theoretically oriented explanatory propositions can be tested and subjected to a directly empirical form of validation and verification. For post-attack time, however, both the general properties of the social system and the challenges to its analytic description which arise from "reality" are products of models used to project present society forward into time.

While neither this chapter nor this volume has resolved the methodological and epistemological dilemmas implicit in this situation, it may be well to remember that the crucial issue is not always how complete or valid models can be as theoretically perfect constructions, but, rather, how complete and valid they need to be for present purposes. Theoretical liabilities may turn out to be assets, by focusing attention on crucial planning issues.

It will be recalled that while the model of the social system and society proposed in this chapter proceeds from general systems of society-wide patterning to the quite concrete situation of action in which the behaving individual finds himself, it is not, in fact, a model which "strictly determines" the acts of individuals. Rather, it is a model whose levels and components must be themselves described in terms of ranges and limits; the model is a model of conditions which form ranges and limits to determinants of action, rather than a mechanical device which permits specific behavioral predictions once the proper "inputs" are made.[138] Future development of both general models and specific institutional descriptions will emphasize not only the order within these ranges and limits to determinants of action,

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[138] Cf. Figure I-4, p. 61, and pp. 59-65, above.

but also how domains of determinants can conflict and compete, thereby contributing to patterns of indeterminacy and behavioral freedom in a pluralistic society. The model of the social present and social future which now emerges will appear to contain new orders of vexing uncertainties and indeterminacies, which cross-cut and confuse the problem of projecting self-contained system models into an uncertain future. But the emphasis on ranges and limits and a certain degree of indeterminacy in the final situation of action can help the analyst understand the real nature of the function he can perform for the policy-maker and systems planner and designer in American society.

The policy-maker and systems planner and designer in a pluralistic, democratic society may never need a criterion of the social system which enables them to specify or predict all patterns of behavioral ordering at all levels. Their concern must be, rather, with the ranges, limits, and general conditions within which individuals act. In planning systems for reducing societal vulnerability to thermonuclear attack, the final concern will not be to try to preserve every precise determinant and pre-condition of every individual's pattern of behavior, but instead with those general ranges, limits, and conditions within which the values of free men are manifested in individual lives and acts. In the end, the national security planner does not need a theoretically perfect model nearly as much as he needs an understanding of those broad ranges of institutional and social structural patternings which appear to be indispensable as preconditions for valued patterns of social coherence and individual living.

It is in attempting to describe these broad ranges of institutional and social structural patterns that the social analyst will be performing his first function for the national security planner; in the process, he will be creating part of the base for a more adequate theory and model of industrial society. For both planning designed to preserve democratic, pluralistic institutions and for developing theory adequate to the dynamics of industrial society, this descriptive task is a precondition. How well he meets it will determine in significant measure whether the analyst's final model of the social system has a meaningful and adequate basis in the actual workings of social institutions and social structure. In the meantime, his solution to this task can aid the national security planners of a democratic

society in their own task of recognizing and preserving the institutional conditions of living in a society where individuals are free to act in a variety of styles, where institutions do not exist in full harmony and integration, and where the possibilities of private goals and secret dreams draw personal quests toward a future which must always be uncertain.

Appendix to Chapter I

ON READING THE FIVE ESSAYS IN PART II

The five essays in Part II of this volume are exploratory studies in defining the specific social dimensions of thermonuclear attack for several of the most significant institutional sectors of contemporary American society. Using a variety of methods and analytic approaches, the scholars who prepared these essays sought, first, to suggest the features of particular institutional and social structural patterns which will be most significant in affecting social responses to thermonuclear attack and in creating specific forms of vulnerability. Then, in the varying analytic frameworks created by the dimensions which they saw as most relevant, they attempted to describe some of the most important specific consequences of thermonuclear attack which appeared likely to occur.

The purpose of this Appendix is to tell something of how these essays came to be written, of how and why these essays differ in style and approach, and of how each essay is part of a larger effort to define the dimensions of social vulnerability and social response to thermonuclear attack. The Appendix has been written in the spirit of the dialogue which has existed among the five contributors to this volume. From the start of this dialogue to the present, one of the key procedural rules has been that studies of the social dimensions of thermonuclear attack could not result from the mere application of social models, neat experimental designs, and orthodox research methods to the problems of extrapolating from present to post-attack society. Each author was intensely aware that he was being asked to speak about a future which he didn't really know. He was confronted with the constant need to decide for himself what findings and methods in his own field of special competence would be most relevant to projecting the social effects of thermonuclear attack, and in many instances, he made this selection in full knowledge that he had no method available for a really satisfying test of whether he had made the right selection. This Appendix tells something of how the dialogue among the five contributors was organized and how each of the four contributors to Part II was oriented to his task. It records some of the analytic compromises which had to be made if the tasks were to be done at all.

Too many research monographs and reports of symposia present the final product of all the hard work in a neat package which neglects the hard decisions, shifts of emphases, and residual ambiguities which had to be accepted to get the product. Far more than in conventional investigations, post-attack research imposes the obligation on the researcher to tell in his final accounting how he did his work and where he made his critical decisions about what it was feasible to do. The methodological difficulties are enormous --- some would say insurmountable --- and the reader who is aware of these difficulties will rightfully resist signs of false closure. This Appendix is to answer a number of the questions about the kind of analytic closure that was achieved. Although it cannot be done now, perhaps in another time and place it may be possible to give a full history of the project.[1]

Because of the need to engage in first explorations as well as a comprehensive survey of a range of substantive issues, most of the essays in Part II do not incorporate specific, detailed statements of methodology. Nevertheless, all of the writers found themselves intensely preoccupied with the nature of the assumptions they had to use. Early in the project, the editor decided that he would ask for no more complete a statement of method than the individual writer, working within his own tradition and framework, felt he could give.

But he decided also that he would include in full the statements each writer had to make on the scientific uncertainties and personal horrors of thinking about thermonuclear war. While there is some redundancy among the opening passages of several essays because of this editorial decision, the redundancy is in acknowledgement of the fact that each contributor had to make a number of personal decisions as a scholar before he could begin his work. Nor did the editor want the eloquent repetitions and affirmations of these opening passages to be lost. He was especially anxious that no one forget that while it is possible to think coherently, analytically, and scientifically about nuclear war, the reality of nuclear attack

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[1] Phillip E. Hammond (ed.), Sociologists at Work: Essays on the Craft of Social Research (New York: Basic Books, Inc., 1964) presents the kind of research "case histories" which it might be useful to provide for the present project some day.

itself is an ugly thing, fully as poignant in its effects as the image of Babylon's destruction which the Evangelist conjured at the end of the New Testament:

> So shall ... the great city be thrown down with violence, and shall be found no more;
> and the sound of harpers and minstrels, of flute players and trumpeters, shall be heard in thee no more;
> and a craftsman of any craft shall be found in thee no more;
> and the sound of the millstone shall be heard in thee no more;
> and the light of a lamp shall shine in thee no more;
> and the voice of the bridegroom and bride shall be heard in thee no more; ... .[2]

This Appendix continues with a short account of how the topics for the essays in Part II were chosen and how the writers were given a common framework of assumptions within which to work. It notes the differences in the images of post-attack time which are required to analyze sequences of effects in different institutional sectors of society. It concludes with an analysis of some of the relationships which exist among the essays as individual units within a group of studies.

The Evolution of the Five Essays

The decision to undertake these essays began in the realization that to describe the conditions which will contribute to the recovery of society from thermonuclear war, it is necessary to distinguish two quite separate sources of the concepts of "vulnerability" and "recovery" which will guide planners. First, "vulnerability" and "recovery" refer to valued states of individual and social life. A thermonuclear attack may directly alter these valued states. Consequently, everyone has intuitive notions of "vulnerability" and "recovery". "Vulnerability" is the possibility, creation, or continuation of any social condition which would deprive individuals and groups of the pursuit of presently valued patterns of living. "Recovery" is any total state of the society, achieved through pursuit of appropriate intermediate goals, which restores these presently valued patterns or their

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[2] The Bible (RSV), Book of Revelation 18: 21-23.

equivalents.[3] These definitions of vulnerability and recovery are inherently conservative, taking essentially the restoration of pre-attack society as the criterion against which to measure the effectiveness of vulnerability reduction and recovery management systems.

It appeared, however, that thermonuclear attack could alter patterns of individual behavior and social structure, and thereby it could modify some of the conditions upon which valued patterns of living have depended. If so, "vulnerability" and "recovery" must be defined not purely in terms of values and policies, but in terms of the ways in which thermonuclear attack might have significant effects on the structures and processes of society. From this perspective, "vulnerability" and "recovery" are concepts which do not depend directly on values for their meaning. Instead, the study of "vulnerability" is the study of those effects which thermonuclear attack might have on stable patterns and pre-conditions of individual behavior, social structure, and institutional patterning, and which might result in significant alterations of these social forms. The study of "recovery" becomes the study of what would be required to reverse or stabilize these alterations, whether or not it were "desirable" to attempt this reversal or stabilization after attack. Implicit in this study is the ultimate question --- a question not answered in this volume --- of how much damage complex society can sustain before it enters a phase of irreversible institutional decline.

Obviously there are certain dependencies between these two broad orientations toward vulnerability and recovery. What exists after attack may very well influence survivors' conceptions of what is now desirable. Citizens' pre-attack conceptions of what is desirable and worth preserving may focus attention on detailed studies of the objective conditions for preserving these values. The resulting fund of information could contribute to more effective countermeasure systems.

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[3] If the concept "recovery" reflects values and decisions based on values and images of the desirable, then there is nothing to prevent individuals from agreeing, before or after attack, that new patterns of living would be acceptable and potentially desirable, in the face of old patterns which were no longer feasible. In this light, processes of recovery from certain lower levels of attack targetings might be considered as special cases in the theory of social change.

"More effective" performance would then be measured by increased likelihood of preserving those pre-conditions of values which are independent of values.

Granting these interpenetrations and dependencies exist, it seemed more crucial to explore the ways in which thermonuclear attack might create ranges of individual, group, and institutional responses. From these responses, some estimate of the post-attack characteristics of American society could be made. These estimates would form the basis for determining whether the pre-conditions of valued behavioral possibilities and institutional forms would exist after attack. Estimates of how these pre-conditions might change if they were unprotected could form the basis for setting "requirements" of countermeasure systems which would be designed and built before attack. From the scientific point of view, the question of what attack could do to social patterns is logically prior to the question of what steps should be taken to preserve these patterns or to guide post-attack changes in coherent and desirable ways.

Accordingly, Neil Smelser agreed to undertake an exploratory look at the kinds of information which appeared to be available for making inferences about possible social effects of certain ranges of attack. As his work proceeded, a dual emphasis emerged. On the one hand, he sought to integrate existing evidence into particular "conditional predictions" of attack effects. Complementary to this effort to construct particular propositions, Smelser examined the scientific grounds which might justify making these conditional predictions. This effort came to be the dominant effort, but its full fruition did not come until later in the project, when Smelser prepared his second contribution to this volume, the present Chapter VI on methodological issues in the social analysis of nuclear attack and recovery. His first effort resulted in Chapter II, "The Social Dimensions of Nuclear Attack". This chapter is primarily substantive in emphasis, but the reader will note that Smelser is as concerned in this chapter with establishing the relevant domains of behavior for different post-attack periods as he is with constructing a rigorously integrated set of conditional predictions. The social dimensions of nuclear attack emerge as the dimensions of these domains.

As the work which led to Smelser's Chapter II proceeded, it appeared that specific analyses of particular, crucial institutional domains should be undertaken.

Two scholars with standing interests in the problems of post-attack society agreed to undertake papers in their areas of special experience. The results were the present Chapter III, by David Heer, on possible demographic features of post-attack society, and the present Chapter IV, by Sidney Winter, on the economic dimensions of post-attack recovery. Both papers combined descriptions of specific social sectors with speculations on the kinds of policies which might be required to preserve the pre-conditions for institutional patterns which had characterized pre-attack society.

Up to this point in the project, no specific attention had been paid to the persistent question of what thermonuclear attack might do to values themselves, and how values in the culture of society would mediate social responses to massive disaster. Making predictions about the effects of values and possible shifts in values is an especially elusive undertaking, however, and the editor decided that a first consideration of the possible effects of nuclear attack in both invoking and altering patterns of cultural values should have a relatively concrete topical emphasis. At the same time, as the earlier essays progressed, it had become evident that possible patterns of vulnerability in political institutions required immediate survey, in order to define emerging questions about the institutional conditions for setting social controls and maintaining social direction in post-attack society. After a number of discussions with the editor on the relations between larger patterns of cultural values and specific institutional patterns, Howard Swearer agreed to combine the topics of cultural values and political institutions, in a comparative study of the political and administrative dimensions required to describe the potential effects of nuclear stress on local government in the United States and the Soviet Union. This study, which appears as Chapter V, analyzes potential differences between responses to stress in a social order based on relatively extensive official controls over individual behavior and responses in a social order with pluralistic foundations, relative lack of institutional integration, and wider latitudes for individual autonomy. While Swearer presents case material on the Soviet Union which is of great intrinsic interest, his primary purpose is to highlight distinctive institutional patterns in contemporary America, through the technique of comparing these patterns with a society which has comparable size and complexity but a different institutional order.

The five papers in Part II were begun, therefore, at different times and with quite different analytic methods and perspectives. One procedural rule in directing them might have been to present each author with the same basic assumptions and then to require him to develop his own special topic without any contact with the other authors. In this way, it might have been possible to use each author as a kind of "experimental control" on the others, and to have learned more about the varieties of independent methodologies that could be applied to the study of the social consequences of nuclear attack. This would probably have been a spurious procedure, however, for the authors each had quite different topics. Furthermore, there was no systematic way of describing in advance the methodologies each would use. Thus, there could have been no meaningful association drawn between different topical emphases and both same and different methodologies applied comparatively to their analysis. Taking into account the exploratory function that these studies were to perform, it seemed, also, that much was to be gained by allowing each author to react to the work of the others wherever it was possible, when drafts and final essays became available. In this way, each writer might have the opportunity to draw upon insights, hypotheses, and the cumulative knowledge of the others. Various methodologies could converge in a total set of shared perspectives on the most efficient ways of studying the ambiguities of post-attack society.

It seemed particularly important to encourage communication among the authors because of the wide differences in scholarly background experience they had had with the study of nuclear weapons effects. Sidney Winter had had several years prior experience as a government consultant and RAND staff member working with problems of nuclear weapons and civil defense. During this time he had presented Congressional testimony and authored a monograph on possible ranges in the structure of the post-attack economy.[4] David Heer had completed a study of population traits and problems which certain assumed attack patterns could produce

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[4]United States House of Representatives, Military Operations Subcommittee of the Committee on Government Operations, Civil Defense - 1961, 87th Congress, 1st Session, especially pp. 303-326. Sidney G. Winter, Jr., Economic Viability After Thermonuclear War: The Limits of Feasible Production (Santa Monica, Calif.: The RAND Corporation, RM-3436-PR, September, 1963).

in American society.[5] On the other hand, Neil Smelser and Howard Swearer had not given major attention to the study of nuclear war before the essays which they prepared for this volume. The existence of these varying levels of prior experience among the authors made it possible for some members of the group to contribute already formulated ideas and intellectual criticisms to the store of information and assumptions in these essays, while others could raise issues from the vantage points of fresh perspectives applied to new problems. The reader will note in footnote reference citations that authors freely drew upon each other's work where it was relevant to do so, in order to clear the ground for their own tasks. It should be noted, however, that there was no formal process whereby authors' drafts were circulated among the group. Administrative constraints made it impossible to organize such a procedure. Instead, where convenient and feasible, authors communicated directly with each other, to increase their access to existing work, to test ideas, to offer criticisms, and to challenge assumptions. Sometimes the editor assisted in this process.

Assumptions Guiding the Essays

While the editor defined the topics for the five essays within the conceptual framework which he has already outlined in Chapter I, he made no attempt to require the authors to think or work within this framework. In Chapter VII of this volume, the editor will suggest some of the relations which he sees among the institutional domains and patterns described by the authors in Part II. The essays of Part II were written to contribute ultimately to the kind of analysis presented in Chapter VII. It must be emphasized, however, that the authors in Part II did not have access to drafts of Chapter I during their own writing, nor were they asked to subscribe to the conceptual approach toward society taken in it. As part of the basic bibliography which all authors were asked to review before undertaking their own researches, they did have access to "working paper" statements of some of

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[5] Published as David M. Heer, After Nuclear Attack: A Demographic Inquiry (New York: Frederick A. Praeger, 1965).

the ideas in Chapter I.[6] These ideas were presented to them as part of their general orientation to the project, however, and not to provide a model of society for their own use. Certainly not all of the contributors to Part II would agree fully to the utility of what was done in Chapter I, just as they would doubtless disagree on a number of matters among themselves. This is to be expected --- and encouraged --- when researchers confront issues of the scope attempted in this volume.

The authors in Part II were viewed by the editor less as contributors of pieces to a final, tightly integrated analysis, and more as primary definers and validators of the issues and domains that it might be necessary to consider in thinking about the social dimensions and social effects of nuclear attack. They were encouraged to marshall their best judgment as well as their scholarly background in defining what they saw as the key analytic issues and substantive findings in their particular institutional areas. In the absence of systematic bodies of findings about possible effects of nuclear weapons upon the institutional complexes with which they were most familiar, they were asked to propose their own best conceptual integration.[7]

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[6] As found in Chapter III of Human Sciences Research, Inc., An Approach to the Study of Social and Psychological Effects of Nuclear Attack (McLean, Va.: Human Sciences Research, Inc., March, 1963). The bibliography, which was non-classified, included also a number of standard works, such as Samuel Glasstone (ed.), The Effects of Nuclear Weapons (rev. ed.; Washington: U. S. Government Printing Office, 1962).

[7] The use of the authors as validators of problems as well as analysts of findings is open to the charge that a larger sample of scholars might have chosen different combinations of institutional problems as being more important. Here the editor's function of intensive dialogue with each contributor may have provided some opportunity to test alternate formulations of the most important institutional problems. In the future, it may be possible to broaden the range of "problem validators", in a way not unlike the approach so engagingly described in W. F. Ogburn and M. F. Nimkoff, Technology and the Changing Family (Boston: Houghton Mifflin Company, 1955), pp. 4-8. Ogburn and Nimkoff felt they had a potential problem in the possibility that they would limit their list of family changes in American society to "those that fitted their theories of social causation". Ibid., p. 4. So, they went out and invited experts to submit their own lists!

In several senses, then, the essays in Part II are "criterion essays". They are criterion essays, first, in that each author defines the valid, substantive domains of problems which must be considered in order to locate the possible effects of nuclear attack on particular institutions. The author must act as a source of criteria for stating these problems, and he must measure possible effects of attack as they may be described in terms of the substantive domains which he has chosen as most relevant. Second, the essays are "criterion essays" in that they describe general institutional dimensions as criteria or "constraint sets" for specific patterns of social action in both pre-attack and post-attack society.[8] Third, insofar as these essays can identify characteristics of social behavior, social structure, and institutional patterns which must be preserved or inhibited to reduce "vulnerability" and enhance the prospects of post-attack "recovery", they point to elements of the social system for which specific countermeasures must be designed. In this third sense of "criterion", the essays establish criteria in present and possible social phenomena by which to set requirements of future countermeasure systems and to judge the present relevance of existing countermeasure systems to actual patterns of social life and social interdependence.

In performing their tasks of describing elements of institutional and behavioral patterns which may effect social responses to nuclear attack, the writers were guided by the attack scenario described above in Chapter I, pp. 149-154. As is explained there, a basic reason for this choice of scenario was that it forced immediate consideration of how whole institutional and social structural patterns may affect responses to attack. The authors recognized, however, that the range of possible attack magnitudes permitted by the scenario might produce radically different patterns of attack effect, depending upon the size of attack chosen. An attack of 1,500 megatons is, today, a relatively small attack, yet in order to use detailed, non-classified attack assumptions, David Heer had to use this level of attack in his initial demographic studies to which he refers in Chapter III. In Chapter IV, Sidney Winter indicates that for certain orders of effects, he feels

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[8] See the discussion on p. 137, above.

progressively less confident of the analytic results as the attack increases in magnitude. For the present "criterion" and definitional purposes, such limitations need not be crippling. The primary task for each author was to use the attack scenario as a stimulus to thought; within the latitudes set by the scenario, he could emphasize those levels of attack that seemed most relevant and feasible for identifying the problems and sequences of effects which attack could create in his particular institutional domain. Each author was encouraged, where possible, to present specific propositions about possible social effects of attack. Time and again, though, there were indications that such propositions might be premature. The primary task was, instead, to present dimensions of social institutions and the substantive, social criteria for recognizing how these institutions would act as mediators of attack effects.

In working out the topics and the assumptions guiding each essay, the editor met several times for lengthy discussions with the writer in the writer's own office. During the writing of the essays, the editor reviewed their progress in return visits. In some instances, he encouraged the exchange of preliminary criticisms among authors. Usually the authors were able to provide independent academic and professional forums for testing their ideas. These occasions often led to spirited exchanges, which became interesting --- though sometimes intellectually gory --- side bonuses for having written a paper on these topics. The problem-defining and exploratory nature of this volume suggested that it be non-classified and that its essays use non-classified sources. The consequent freedom from security constraints enabled individual authors to incorporate their writing into the mainstream of their immediate professional concerns and to talk about this work with a variety of professional colleagues on university faculties and in research organizations. This they did, with sometimes lively results.

Institutions and the Phases of Post-Attack Time

Because of the possible persistence of residual weapons effects for some weeks after many possible forms of attack, an analysis of post-attack society and social behavior must acknowledge continuing needs for countermeasures against these residual effects as well as against immediate physical damage. These

residual effects dictate that if a population is to survive, it must be sheltered in areas of harmful radiation. The length of this sheltering requirement for a particular sub-population will be a function of attack targeting, weapons yields, and a number of environmental and climatic conditions. Any consideration of social effects after attack begins, therefore, with an analysis of the ways in which immediate physical damage and residual weapons effects impose fundamental constraints upon social life.

Previous writers have responded to this requirement by showing how post-attack behavior and society necessarily move through a series of time-dependent post-attack phases. Nordlie and Popper proposed that it was meaningful to consider post-attack social life as moving through four phases: an Impact Phase, which coincides with the period of attack and immediate aftermath; a Closed Up Phase, during which much of the population will be in physical shelter from weapons effects; an Emergence Phase, during which the sheltered population gradually leaves secure physical environments and begins organizing for rebuilding; and a Reconstitution Phase of indeterminate length, during which the actual work of societal reconstruction is done.[9] Vestermark proposed a modification of this scheme, to provide especially for more differentiation among crucial events early in post-attack time.[10] He labeled the Impact and Closed Up Phases the Shock and Shield Phase, to allow for the probability that many members of the society would be in shelter, while others would be outside shelter but stunned and relatively immobilized by the immediate impact of attack. Thus, attack produces an immediate shock which fractionates the spatial organization of the society into relatively immobilized components living in different immediate environments. He differentiated Nordlie and Popper's Emergence Phase into three phases: a period of First Emergence, when individuals may be free to remain outside shelter only a short time, and when individuals already outside shelters may temporarily enter contaminated areas for moderate periods of time; an Initial Recovery Phase, when individuals temporarily outside

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[9] Peter G. Nordlie and Robert D. Popper, Social Phenomena in a Post-Nuclear Attack Situation: Synopses of Likely Social Effects of the Physical Damage (Arlington, Va.: Human Sciences Research, Inc., 1961), pp. 3-5.

[10] Human Sciences Research, Inc., op. cit., pp. 165-170.

can begin organizing and conducting recovery operations in the non-shelter environment, and when individuals from relatively safe areas may join forces with the emerging shelter population in common recovery efforts; and a period of Final Emergence. This Final Emergence interval marks the transition to a longer term of Reconstruction and Recovery, which restores the organizational foundations for a process of Final Recovery which may last many decades.

The authors of the five essays in Part II were familiarized with these and similar schemes for describing post-attack time phases. After this, they were permitted to define whatever scheme of post-attack phases seemed most appropriate to portray the time-dependent sequences within which their particular institutional patterns might affect post-attack behavior. The schemes which they evolved are presented in Figure Ia-1 (p. 198), in comparison with the two schemes which have just been outlined. The horizontal axis of Figure Ia-1 is demarcated in terms of weeks after attack impact. The vertical axis arrays six schemes for defining post-attack time, four of which are used explicitly or implicitly by the authors of the studies in Part II. By comparing each scheme across the common period of weeks after attack impact, the reader will observe some striking differences. These differences provide clues to the content of the five essays to follow, and in their own right they stand as a kind of preliminary general finding on the relations between institutions and patterns of post-attack social responses.

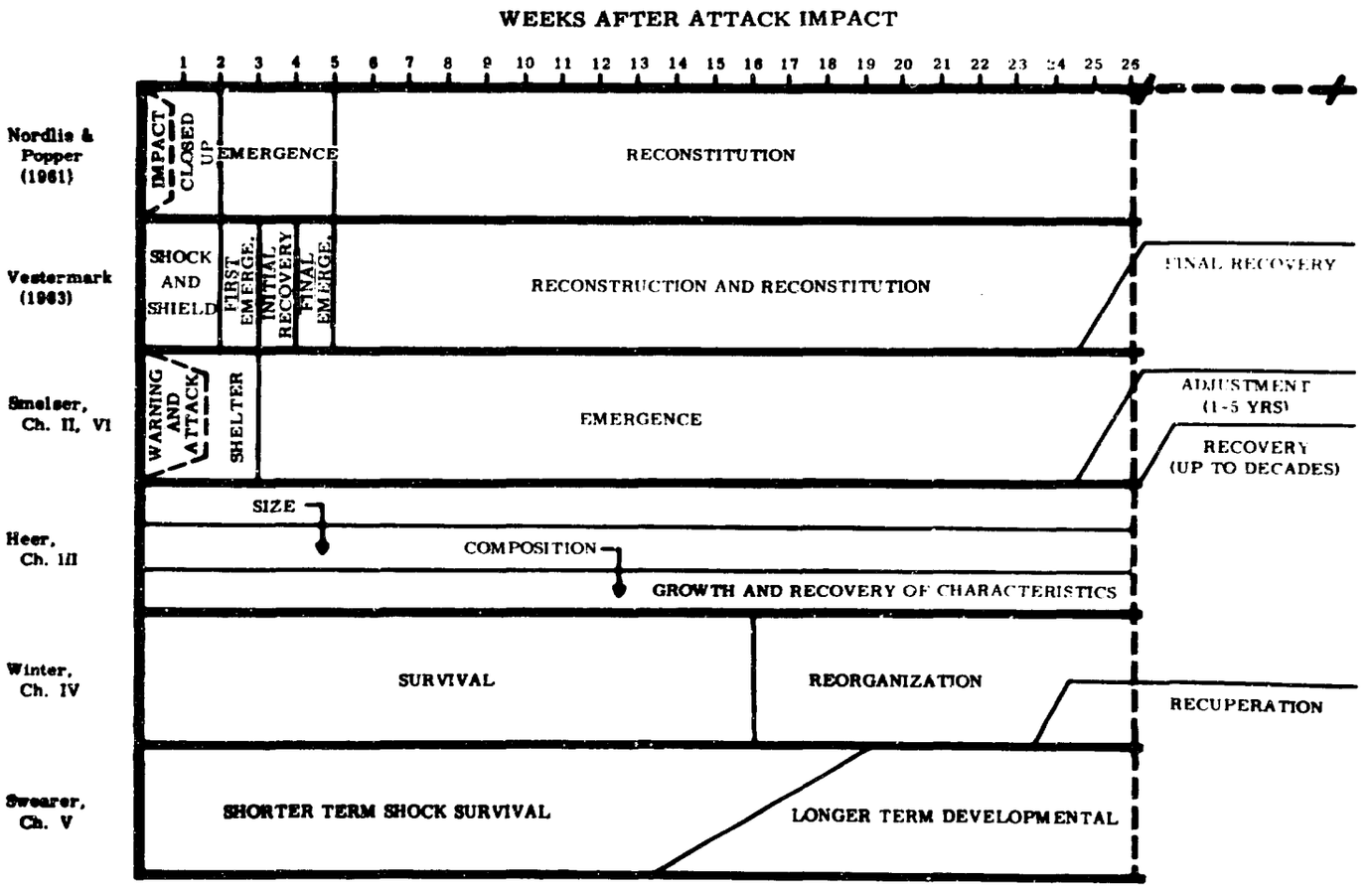
These differences show that as the level for analyzing behavioral determinants shifts, from the immediate situation of action and adaptation toward post-attack effects created by institutional patterns with maintenance functions, there are necessary shifts in the comparative lengths and relationships among the different phases of post-attack time.[11] Indeed, within the shorter term perspective imposed by twenty-six weeks, meaningful time phases in the demographic (ecological system) sector appear to vanish altogether.

As will be clear from Figure Ia-1, the schemes of Nordlie and Popper and of Vestermark provide quite precise differentiations for periods in the early weeks

[11] See the discussion of behavioral determinants, pp. 103-123, above, and especially Figure I-8, p. 115, above.

Figure Ia-1

COMPARISON OF SIX SCHEMES FOR DEFINING POST-ATTACK TIME PHASES



after attack. Both schemes, in the absence of a clearer view of longer term institutional and social structural effects in mediating post-attack responses, gave special emphasis to the sequence of time phases needed to describe immediate collective responses to attack. In considering the determinants of these collective responses, there was special need to consider the conditions under which individuals will exist after attack. Longer term societal responses as well as the definition of recovery itself were necessarily viewed as outcomes of earlier phases which could be more precisely specified. As Nordlie and Popper say in their definition of their "Reconstitution Phase", "the occurrence of this phase is contingent on directions taken in the preceding phases. We intend to designate by this phase the occurrence of conditions which indicate that the society is moving toward recovery, rather than the reverse."[12]

The most precise portion of Smelser's substantive analysis in Chapter II develops a number of propositions on the shorter term collective responses of individuals and groups in the immediate situation of action. Particularly because of his interest in considering such phenomena as the determinants of panic, Smelser adds a "Warning Phase" as a domain of determinants which has special significance. But Smelser also differentiates the longer term processes of social reconstruction. His Emergence Phase, compared with those of the two earlier schemes, is much longer and with more complex patterns of operative determinants. It covers an interval of approximately six months, a period during which institutional and organizational pre-conditions must be created for an Adjustment Phase. This Adjustment Phase begins gradually, and after a period of some years, it is translated into a very long term process of Recovery.

Sidney Winter's phases --- in a twenty-six week framework --- are less precise and of longer relative duration. While the economy is perhaps the most critical sector for performing the concrete adaptive functions which will be the basis for the restoration of the full processes of complex society, it must be analyzed primarily in terms of its organizational and structural problems as an

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[12] Nordlie and Popper, op. cit., p. 5.

institutional sector within the whole social system. In considering the strictly economic dimensions of post-attack time, the analysis shifts toward treating two fundamental institutional problems. First, will conditions exist for shorter range economic survival? Second, can organizational dilemmas in the economy and polity be resolved in the longer run, so that various orders of resources can be combined into a gradually phased process of recuperation? In the temporal framework required in the analysis of these problems, the immediate problems of meeting per capita consumption needs of attack survivors are only a special case of the more complex problem of survival. Indeed, meeting these needs is no longer strictly a problem of economic institutions. Rather, it is first a problem of effective pre-attack stocking and pre-positioning of supplies which survivors will need. Then, the problem is one of guiding immediate collective responses to attack and its aftermath, into directions which permit the effective utilization of these stocks. But this guidance implies effective pre-attack planning of systems for mobilizing, sheltering, and organizing the population. This requires solution to problems of social organization beyond the economy.

Howard Swearer's scheme parallels Winter's, but it is less precise.[13] From his point of view, the key issue centers around how the cultural system, reflected in administrative patterns, enables the social system to withstand the shock of disaster in the shorter run, so that longer run processes of institutional integration and development can resume. Swearer's approach (as does Smelser's) allows for the possibility that cataclysm can be the stimulus to new lines of institutional development. Here the cultural system of the Soviet "crisis-oriented" society provides a provocative contrast with the foundations of American political institutions.

The analysis has now moved from a primary concern with adaptive functions to a primary concern with maintenance functions. Post-attack time phases are

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[13] The slanting phase boundary here and elsewhere in Figure Ia-1 indicates that the phase boundary is only approximate and that the onset of the next phase is gradual. In some cases, the editor had to compute the approximate location of both slanted and vertical phase boundaries from internal evidence in a particular essay, in the absence of the author's having given a fully precise or consistent definition to his temporal scheme.

increasingly less precise. In considering the demographic dimensions of social vulnerability and recovery, David Heer dispenses altogether with a formal scheme of temporal phases. Instead, to consider the restoration of the population system of society, Heer points to three levels of problems. Solutions to these problems interact to create the gradual restoration of a self-maintaining population which has desired and necessary traits. Earlier in post-attack time, the problem of the size of the population appears to be critical, because size will be the basic constraint on population composition and on the rate at which the population recovers its pre-attack characteristics. A little later, composition of traits becomes critical, if society is to have the demographic resources for effective short range rebuilding and longer term recovery. After problems resulting from possible shifts in population have been solved, it is meaningful to give special emphasis to conditions governing the rate at which the population grows and recovers its characteristics. These three problems are interacting elements of the total problem of restoring an effectively self-maintaining group of population traits over several generations. The three problems point to complementary patterns of constraints which will govern the re-emergence of population patterns necessary to an industrial social order.

Independently of guidance from the editor, the four analysts in Part II appeared to respond to the separation of functions among the different levels at which behavior is organized in society. This does not necessarily constitute a validation of the conceptual approach taken in Chapter I. It does suggest, however, that to understand the set of total processes governing individual and social responses to attack effects, it is necessary to know, at any one point in post-attack time, how institutional and structural determinants of behavior have been differentially as well as sequentially activated. At any cross-section taken through post-attack time, the total set of institutional determinants of social action within the social system will have generated a complex set of sometimes conflicting, sometimes complementary, demands on individual behavior, group living, and public policy.

Themes and Relations Among the Five Essays

As the discussion of Figure Ia-1 indicated, the five essays of Part II offer complementary descriptions of post-attack life, as this life will be organized on a variety of levels of society. At the beginning of each essay in Part II, the reader will find a brief introduction by the editor. This introduction summarizes the principal themes of the essay and shows how its portrait of a social sector might fit into a larger view of post-attack society. The Appendix concludes now with some remarks which anticipate these introductions, by suggesting some basic patterns of complementarity among the five essays.

It was the intent of the editor that the essays in Part II be not only analytically complementary, but that they provide a coherent exposition and unfolding of the issues in pondering the social dimensions of nuclear attack. The essays begin with Neil Smelser's general review of the social dimensions of nuclear attack in Chapter II. His emphasis in this chapter is on the kinds of substantive propositions and dimensions which present evidence permits the analyst to state. While Smelser devotes special attention to considering the inferences which can be drawn from many studies of human collective responses to stress, he also proposes a number of issues, to which the analysts in Chapters III, IV, and V turn in their detailed studies.

Chapters III through V are analyses of the dimensions and domains in which particular effects of nuclear attack may be expressed in several critical institutional sectors. David Heer's Chapter III presents an outline of the principal dimensions of nuclear attack effects expressed against the human population in the ecological system of society. In Chapter IV, Sidney Winter describes the structure, policy problems, and analytic issues of the economic sector of the social system, in relation to the effects of nuclear attack. In Chapter V, Howard Swearer turns to the possible differential patterns of response to disaster which occur in political institutions with contrasting bases in values, procedural assumptions, and social history.

In its use of the comparative method for describing two cases of administrative organization, Swearer's essay is also a specific application of one of the

principal techniques for conducting social research on the effects of thermonuclear war. In Chapter VI, Neil Smelser uses the comparative method of social research as a technique for stating and partly resolving some of the principal methodological issues which arise in the social analysis of nuclear attack and recovery. He shows the special utility of this method in organizing and evaluating the many orders of data which appear relevant to making projections about post-attack social life. His Chapter VI is intended as a specific complement to Chapter II, for in it Smelser makes a methodological assessment of issues and questions he developed in his earlier chapter.

Thus the essays come full circle. They begin with a brief general portrait of the kind of social world which may exist after thermonuclear attack. They continue with detailed analyses of institutional sectors which will be crucial in mediating social responses to attack. In this central group of essays (Chapters III through V), there are a number of relatively firmly based propositions about the particular social dimensions and effects of nuclear attack. As Part II proceeds, however, questions of methodology become increasingly salient. The essays end, therefore, not with a summation of what is known, but with a look at many of the principal methodological issues which must be confronted if the study of social responses to nuclear attack is to be a feasible undertaking in pre-attack time. It is the hope of the editor and the other contributors to this volume that as the reader reaches the end of Part II, he will have a more complete understanding of how the study of the social dimensions of nuclear attack raises so many of the questions which are fundamental to the future of the social sciences as well as to the future of man.

PART II

FIVE CRITERION ESSAYS

Introduction to Chapter II

In "The Social Dimensions of Nuclear Attack", Neil J. Smelser provides a first view of the principal domains of institutional structure and social behavior which will set ranges and limits to the social effects of thermonuclear attack. He breaks his domains into several groups of variables. These are:

> -major independent variables, "which concern the dimensions of nuclear attack";
>
> -major first-order dependent variables, which "concern the short-run behavioral responses of the population during and after the attack";
>
> -major first-order intervening variables, "which intervene between the attack itself and the various short-run behavioral responses --- concern the posture of American society at the time of attack";
>
> -second-order intervening variables, which "become relevant after the various short-term behavioral responses have begun to appear in the wake of an attack. These variables concern the attempts of the surviving agencies of social control to contain and manage these behavioral responses, and to channel behavior into lines of recovery and reconstruction".
>
> -second-order dependent variables, which "concern the resultant pattern of recovery of the society".

He proposes that the determinants of post-attack responses will have "differential salience", according to phases of post-attack time. These phases are the "Warning and attack phase", the "Shelter phase", the "Emergence phase", the "Adjustment phase", and the "Recovery phase".

After considering the problems in constructing valid propositions about post-attack behavior, Smelser defines his primary task to mean making a number of "conditional predictions" about post-attack society. He then subjects society to an imagined thermonuclear attack and considers the social consequences in different phases of post-attack time. In the earlier periods of post-attack time, Smelser emphasizes collective responses in the immediate situation of social action and adaptation. He makes a number of practical suggestions on the management of the

surviving population. As the time after attack lengthens, the analysis shifts toward a consideration of the effects attack has had on social structure and social institutions. What problems will limit the effects of institutions in ordering the post-attack social structure and in maintaining social control? What will be the characteristics of institutions as social recovery proceeds?

In considering the institutional characteristics and requirements of longer term social recovery, Smelser observes that the problem of longer term recovery raises many of the analytic issues which arise in the general study of social and economic development. He sketches two patterns of development: one characteristic of the Anglo-Saxon democracies of Northwest Europe and North America, the other characteristic of the "newer" nations of Asia and Africa. Smelser concludes that three elements of the American socio-cultural heritage surviving thermonuclear attack will be conducive to a relatively rapid recovery rate: the persistence of values and ideologies characteristic of industrial society; the capacity for substitutability of roles among a labor force which has the high level of skills and commitments required by industrial society; and the inheritance of technological knowledge. The presence of these factors will create effects which will differentiate the social dislocation of an industrial society recovering from a nuclear war from the social dislocation of a society undergoing development.

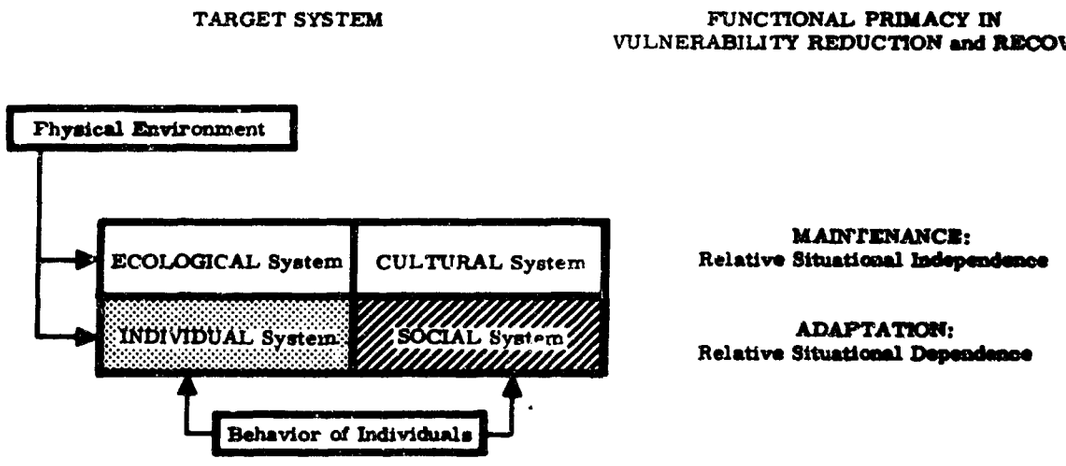
In general, the social dislocation of a society which has experienced thermonuclear attack will result directly from the effects of the attack and consequent allocations of individuals to high-priority recovery goals. Smelser feels that many of the major institutional problems of long-term recovery will arise from the unprecedentedly broad involvement of the government in the various institutional sectors of social life. One result of Smelser's analysis is to challenge a frequently encountered fantasy: that after nuclear attack, society will have "regressed" to more elementary social forms. Smelser holds that the elements of complex social life will continue to exist. The task will be one of reorganizing, not of beginning a long upward struggle from social primitivism.

While Smelser discusses institutional spheres on the level of maintenance as well as of adaptation, his primary emphasis is upon responses of the social system and the individual as a system --- response patterns which are relatively

dependent on the post-attack situation of action. As Part II continues, other authors will give primary emphasis to different institutional levels and systems. To assist in visualizing the relation of Smelser's analysis to the other institutional orientations in Part II, Figure IIa-1 locates Smelser's primary analytic emphases among the four basic systems of society which were described in Chapter I. This Figure is a restatement of Figure I-8 on page 115. The system to which Smelser has devoted primary attention has been indicated by diagonal stripes; the system of next importance in major emphasis is shaded with fine dots.

Figure IIa-1

PRIMARY TOPICAL EMPHASES OF CHAPTER II



Each of the brief introductions to the essays in Part II will conclude with this diagram, in order to show the system or systems of society with which each author has been preoccupied. This may assist in guiding the reader toward a sense of the analytic relationships which exist among the essays. In no case, however, has an author in Part II construed his topic to be a fully unified sub-system of society, which would be placed after analysis into a total model of society. For this reason, the reader must remember that the figures which conclude each introduction are nothing more than aids in the complicated task of visualizing relations among domains and problems whose analytic boundaries are not clear.

Chapter II

THE SOCIAL DIMENSIONS OF NUCLEAR ATTACK

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Most contemporary thinking about the effects of nuclear war is shrouded in emotion. And well it should be. Even the uninformed fantasy reveals the most fundamental truth about a nuclear attack: It would multiply a millionfold those deep personal tragedies that the death and suffering of loved ones bring. Beyond the countless personal agonies, a nuclear war of the dimensions possible today would shake the very foundations of our civilization.

While it is proper to view modern war with awe and anxiety--it would be unrealistic to do otherwise--these justifiable emotions extort their price when it comes to thinking intelligently about the concrete effects of such a war. Supercharged emotions are likely to give rise either to prophecies of total destruction or to easy solutions concerning the advent and effects of massive attack--both of which readily harden into brittle obstacles to further thought. No matter how awful, the potential effects of nuclear attack are very complex and not subject to simple diagnosis by quick formulae. In fact, this complexity is so great that the study of modern war demands the same scientific detachment--difficult as it may be in this case--that we use in approaching any other natural phenomenon.

The most scientifically adequate estimates about the possible effects of nuclear war and the possible recovery from it concern the numbers of dead and injured and the degree of destruction of economic resources (food, housing, fuel, and the economy's productive capacity).[1] Most projections of these biological and

[1] See, for example, Herman Kahn, On Thermonuclear War (Princeton, N. J.: Princeton University Press, 1960); R. Fryklund, 100 Million Lives (New York: The Macmillan Company, 1962); United States Congress, Joint Committee on Atomic Energy, Biological and Environmental Effects of Nuclear War

physical effects contain many of the usual components of a scientific model. The simplest model contains a set of independent variables and a set of dependent variables. The independent variables concern the dimensions of the nuclear onslaught itself. The dimensions of variation are, for instance, the number of separate attacks; the absolute size of attacks in megatonnage; the pattern of attacks, especially whether directed primarily against military targets, primarily at population centers, or some combination of these; the relative proportions of surface and high-altitude blasts. These dimensions are often expressed in terms of measures of destructive potential--blast, initial radiation, thermal radiation, and fallout. The dependent variables concern the degree of physical and biological destruction. The dimensions of variation are, for instance, the numbers of people (or proportion of the population) killed and injured; the damage to buildings and residences; the destruction of key resources, such as food, water, and fuel; and the disruption of transportation and communication networks. Since both the independent and dependent variables have several dimensions, a sizeable number of different projections can be made, even on the basis of this fairly simple model.

More complicated models emerge when we introduce intervening variables that deal with the disposition of resources and people at the time of attack. Besides the obvious demographic and ecological givens--such as the degree of concentration of persons and dwellings in metropolitan areas--these dispositional variables concern the time of day of attack (which is translated into the dispersion of population among schools, workplaces, and homes); the number of available shelters; the number of persons who will have been able to reach shelters before the blast, and so on. When these intervening variables are combined with the independent variables, many separate projections can be generated and a considerable knowledge of both the degree of destruction and the recovery needs of society can be accumulated.

(footnote 1 continued) (Washington, D. C.: U. S. Government Printing Office, 1961); National Resource Evaluation Center, Exercise Spadefork: Situation Analysis (Washington, D. C., 1963); National Resource Evaluation Center, Demographic Facets of Nuclear Warfare (Washington, D. C., 1961); United States House of Representatives, Civil Defense--1962. Hearings before a Subcommittee of the Committee on Government Operations. Part I. Testimony of Witnesses, 87th Congress, 2nd Session, 1962, pp. 303-330; David M. Heer, After Nuclear Attack: A Demographic Inquiry (New York: Frederick A. Praeger, 1965).

When we turn to questions of individual and social behavior in the event of nuclear attack (above and beyond the quantitative estimates of death, injury and destruction), we find that contemporary thinking offers a much less stable foundation for making scientific estimates. The reasons for this are several. Our knowledge of behavior in crisis situations is less adequately developed than our knowledge of the physical and biological effects of disasters. Furthermore, deaths and injuries to people on the one hand and residential units destroyed or damaged on the other are much more readily measured than complex behavioral responses, such as the incidence of looting or the incidence of psychosomatic disorders. And last but not least, it is less discomforting for us to envision impersonal "numbers" of deaths and "percentages" of dwellings destroyed than it is to envision the horrible tragedies that individual persons must cope with in the event of a catastrophic attack.

In the face of this ignorance and ambiguity about individual and group behavior in crisis, our "models" and "predictions" are likely to drift toward magical thinking and hysteria. Our "solutions" thus tend to become oversimplified. As an explanation or prediction, magical thinking endows a single independent variable (e.g., "the bomb") with such omnipotence that it would create a situation of, say, absolute pandemonium--of persons rushing frantically and aimlessly about, unable to engage in adaptive behavior of any sort. To think in this way is to create a sort of "negative utopian" view of post-attack society. In contemporary thinking about behavioral responses after nuclear attack several examples of this kind of mentality are evident: (1) The prediction of <u>complete destruction</u> of the world and its people.[2] This mentality clearly makes any attempt to explain human <u>behavior</u> after attack superfluous, since everyone will have perished. (2) The prediction of <u>complete chaos</u>, which takes two forms--first, widespread panic in the face of

[2] For example, Neville Shute, <u>On the Beach</u>, (New York: William Morrow, 1957).

destructive attack,[3] and second, selfish, brutal competition among the survivors.[4] (3) The prediction of totalitarianism, which derives from the notion that if we are to prevent complete pandemonium, it will be necessary to impose a system of total and ruthless control over people and resources.[5]

What do these simplified solutions of the prospects for post-attack society have in common? They all give an absolute answer to an agonizing question: What will life be like after a nuclear onslaught? Even though the prophesies are very pessimistic, it is likely that many people find comfort in believing in them; perhaps it is less intolerable to envision negative utopias (for, believing in them, we know what to fear) than it is to live with the ignorance, ambiguity, and anxiety held out by the prospect of nuclear war (for, living in an atmosphere of uncertainty, we do not know what to fear). The cost of believing in negative utopian visions, however,

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[3] For evidence on how this mentality dominated official British thinking prior to the bombing attacks in World War II, cf. Richard M. Titmuss, Problems of Social Policy (London: His Majesty's Stationery Office, 1950), pp. 16-21. In recent testimony Representative Clarence D. Long of Maryland expressed the following sentiment: "I am afraid that if we ever had a nuclear attack millions of people would die just as a result of panic." United States Congress, Civil Defense--Fallout Shelter Program. Hearings Before Subcommittee No. 3, Committee on Armed Services, House of Representatives, 88th Congress, 1st Session, 1963, Part I, p. 3116.

[4] Otto Klineberg, "Dangers of the Shelter Psychology," in A National Shelter Program: Its Feasibility and Cost - A Report by a Group of Independent Specialists (New York: privately printed by the authors, 1962).

[5] Donald N. Michael, "Psychopathology of Nuclear War," Bulletin of the Atomic Scientists, XVIII, 5 (May, 1962), pp. 28-29. In calling for the federalization of the National Guard, Ashton Devereux of Baltimore County, Maryland, expressed the opinion that "you have got to have a gun in your hand to have anybody follow instructions in case of emergency." United States Congress, Civil Defense--Fallout Shelter Program, Part II (Volume 1), p. 3594. Some of Senator Wayne Morse's questions asked of Secretary of Defense Robert McNamara concerning the degree of anticipated military control reveals his apprehension about the widespread use of martial law in post-attack society. United States House of Representatives, Civil Defense--1962, Part I, pp. 24-26.

is that they are likely to foreclose the possibility of further serious thought about the realistic complexities of post-attack society.[6]

In this introductory analysis I hope to move a step away from the simplistic models of behavior that prevail at present and to move a step toward an understanding of the social dimensions of nuclear attack and recovery in the light of current theory and research in the social sciences. The assertions I shall make will not flow from formal, predictive models; the present state of knowledge permits only approximate predictions based on sketches of formal models. Some of the assertions will be based on carefully-conducted research on disaster situations; others will rest on what is generally known about human behavior in social institutions; and still others will rest on my own frankly speculative notions. Despite these shortcomings in theory and research on human behavior, I am convinced we can improve on our present level of understanding.

To accomplish this objective, I shall base the remainder of the analysis on the following sets of variables, which form an interrelated system:

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[6] Incidentally, this magical quality of thinking has arisen in several quarters with respect to preventing nuclear attack. The following "solutions" might be mentioned: (1) The fantasy of prevention by means of destructive attack. This mentality was most pronounced in the period immediately after World War II when for a time the United States had an absolute advantage in atomic weapons and thereafter a clear relative superiority. The mentality was expressed in the periodic advocacy of "preventive war" in these years; it has declined as the balance of nuclear weapons has evened, and as their destructive potential has increased. (2) The fantasy of prevention by means of passivity, which appears to lie behind certain of the unilateralist disarmament arguments. (3) The fantasy of invulnerability through sheltering. This mentality had a brief flicker of life during a sort of "shelter craze" that touched a small sector of the population during the weeks following the Berlin Crisis of 1961, after President Kennedy had dramatically and publicly called for a massive civil defense effort. (4) One interesting version of the mentalities concerning nuclear attack might be called the fantasy of self-destruction through protection, which holds that shelters will so inflate our sense of invulnerability that we will be willing to risk nuclear destruction. Gerard Piel, "The Illusion of Civil Defense," Bulletin of the Atomic Scientists, XVII, 2 (February, 1962), p. 2.

The major independent variables concern the dimensions of nuclear attack. As indicated above, the possible variations of such an attack are very great. With respect to some of these variations--e.g., whether attacks are multiple, whether attacks are accompanied by foreign invasion--I shall make some simplifying assumptions to be taken as "givens" for purposes of analysis. With respect to other variations--e.g., size of attack, proportions of surface and high-altitude bursts--I shall assume a certain range of variation within which my analysis applies. With respect to still other variations--e.g., warning period-- I shall raise several possibilities in the course of analysis and develop estimates of the different effects.

The major first-order dependent variables concern the short-run behavioral responses of the population during and after the attack. It is impossible to exhaust all the conceivable behavioral responses. I shall concentrate on the possible incidence of the following potential responses opened by massive attack: random, dazed, or immobile behavior; uncontrolled rumor; collective panic; heroic rescue and relief behavior; various psychological effects (including bereavement and all its complications, depression, anxiety, hostility, psychosomatic disorders, etc.); hostile outbursts and scapegoating; criminal and other deviant behavior (black-marketeering, looting, murder); conflict among social groups, including both groups existing before the onslaught (e.g., radical groups) and groups "created" by the nuclear attack (e.g., evacuees from cities vs. citizens of rural areas that escape destruction); religious behavior, including the rise of cults; rebellious and revolutionary activity against the surviving government.

Since the destruction, psychological strain, and social confusion wrought by a nuclear attack will be so great, it is essential for the analyst to conceive of all these behavioral reactions as possibilities; they are tendencies which may be activated by widespread crisis. But it is also essential that the analyst not take the next step--which is tempting to take--and assume that the incidence of deviance, crime, panic, etc. (the dependent variables) is a simple function of the magnitude and pattern of the attack (the independent variables). On the basis of these dimensions of the attack alone we cannot predict which, if any, of these behavioral reactions will be widespread; nor can we predict the differential incidence of these behavioral reactions in different parts of society. To predict the content, timing,

and incidence of these behavioral responses, it is necessary to consider two sets of intervening variables in addition to the amount of destruction caused by the attack.

The major first-order intervening variables--which intervene between the attack itself and the various short-run behavioral responses--concern the posture of American society at the time of attack. Some of the relevant variables--e.g., distribution of people and resources--have already been mentioned. The distinctive features treated in the present analysis, however, are the social and psychological characteristics of American society at the time of attack. I shall ask the following kinds of questions: In the period between warning and blast, how will an individual's family memberships influence his behavior? In the period of initial emergence from shelters (say, two weeks after a major nuclear attack), how will an individual's religious and ethnic identifications affect his behavior? The social and psychological characteristics include distinctive American values, distinctive features of the American "national character," and--not least--the specific information and instruction people have received as to how to behave during a nuclear attack. The description of these social and psychological characteristics yields a partial statement of the strengths and vulnerabilities of American society to nuclear attack. The behavioral responses of the population in the face of a nuclear attack are assumed to be a function both of the dimensions of the attack itself and of the ecological, social, and psychological disposition of the population at the time of the attack.

A number of second-order intervening variables become relevant after the various short-term behavioral responses have begun to appear in the wake of an attack. These variables concern the attempts of the surviving agencies of social control to contain and manage these behavioral responses, and to channel behavior into lines of recovery and reconstruction. By "agencies of social control" I refer to the government, both national and local; the military and the police; religious leaders; the press; community leaders; welfare agencies, and so on. The effectiveness of attempts to control disruptive behavioral reactions is a function of three factors: (a) The degree to which agencies of control have been set up before the attack and the clarity with which they understand their post-attack functions. It is a fairly general rule that if agencies of control are clear as to the nature and scope of their duties before a crisis, the more successful will be the control

functions after an attack.[7] If advance planning fails to cover many contingencies of the post-attack situation, however, it is reasonable to expect that the agencies of control will suffer from confusions of purpose, poor coordination, and conflicts of jurisdiction--and will be less effective for these reasons. (b) The degree to which the agencies of social control are destroyed or debilitated by the attack. It is to be expected, for instance, that any massive nuclear attack will wipe out a sizeable number of state and municipal governments and will cripple the federal government in many of its functions.[8] If alternative agencies of social control are not mobilizable, widespread disorder will reign. (c) The specific responses of the agencies of control to the behavioral responses to the attack that appear. For example, if looting begins to spread, will authorities simply attempt to restore law and order, or will police and military personnel--themselves very likely subject to severe deprivations--join in the looting? Will authorities vacillate in putting down conflict among surviving social groupings? If sporadic religious cults arise, will authorities repress or tolerate them? The way authorities behave in the face of disorder, in short, will determine in large part the content, timing, intensity, and extent of the disorder.

In this analysis I make no fixed assumptions concerning the actual prospects for success or failure of social control in post-attack society. I treat it as one of the important variables that must be analyzed in order to predict behavior in the wake of nuclear attack. I shall vary my assumptions concerning the effectiveness of social control from time to time, and trace the consequences of different assumptions.

One final set of variables remains to be introduced; I shall refer to them as second-order dependent variables. They concern the resultant pattern of recovery of the society. The direction, speed, and effectiveness of recovery are a

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[7] See, for example, S. Schwartz and B. Winograd, "Preparation of Soldiers for Atomic Maneuvers," Journal of Social Issues, X, 3 ([No month], 1954), pp. 42-52; Samuel H. Stouffer, et al., The American Soldier: Combat and Its Aftermath (Princeton: Princeton University Press, 1949), pp. 228-231.

[8] National Resource Evaluation Center, Exercise Spadefork, pp. 9-12.

result of specific combinations of the four sets of variables just reviewed--the seriousness of the attack, the posture of American society at the time of the attack, the short-term behavioral responses, and the attempts of agencies of social control to handle and channel these responses. Although recovery is a very complicated phenomenon, it can be subdivided into two general aspects: (a) Adjustment, which concerns society's holding operations in the face of the immediate crises occasioned by the attack. Depending on the combination of the variables reviewed above, the outcome of the adjustment process could be continuing crisis and maladjustment at one extreme, or fairly rapid fashioning of a temporary social order at the other. (b) Recovery of social resources, population, productive capacity, and institutional life. This refers to the restoration of the day-to-day functions of social life, above and beyond meeting the crises imposed by the nuclear attack. Again, depending on the combination of variables reviewed above, the outcome may be long-term disorganization or stagnation at one extreme, or fairly rapid reconstruction of social life at the other. By using terms like "recovery" and "reconstruction," I do not mean to imply that society will be "restored" to its pre-attack pattern. Any massive nuclear attack will leave in its wake new values, norms, and social cleavages that will permanently affect the organization of society. Nevertheless, many pre-attack social and cultural characteristics of American society (e.g., our democratic traditions) will strongly condition the pattern of recovery.

Even in outline, these several sets of variables constitute a formidable intellectual apparatus. Each set is complex in itself, and the relations among the several sets of variables multiply this complexity. Furthermore, an enormous crisis-producing event such as a nuclear attack is likely to activate all these variables at once; so the analyst confronts an overwhelming tangle of interacting social and psychological phenomena. I have already attempted to sort out part of this tangle by organizing the important variables into classes, and stating some relations among the classes. To facilitate analysis further, I shall assume that certain of these variables increase in salience at some points in the warning-attack-shelter-emergence-adjustment-recovery sequence, and that they recede in salience at other points in the sequence. For example, in the interval between warning and attack, the occupational, familial, and educational "location" of persons will turn

out to be the single most salient set of determinants in accounting for their responses to warning. Later these involvements become less important as immediate determinants of behavior, even though they do not vanish. To systematize this differential salience of determinants, I shall build the discussion around the following hypothetical phases of nuclear attack and recovery. (The time periods entered for each phase are not precise predictions, but merely indicators as to the approximate duration of each phase.)

(1) Warning and attack phase (from 15 minutes to several hours). The main problems in this phase concern the adequacy of warning systems and the movement of persons to appropriate shelters.

(2) Shelter phase (several weeks). In areas heavily contaminated by fallout, activity outside the shelters is impossible, except for specially-equipped work and relief crews. The major psychological and social problems in these areas will concern adjustment to shelter life. In areas that have escaped both destruction and contamination from fallout (very likely thinly-populated, non-strategic parts of the country, depending on the design of the attack) the major social problems will be controlling the movement of the populace, handling apprehensions about future attacks, and preparing for the care of injured and the billeting of evacuees.

(3) Emergence phase (extending approximately one to six months after shelter phase). The major problems in this phase will be allocating and evacuating people; disposing of dead and caring for sick and injured; billeting evacuees; clearing rubble and decontaminating; re-establishing distribution systems for critical resources, such as food, water, and fuel; and re-establishing communication networks. The most salient psychological and social problems will be handling the overwhelming emotions of millions of bereaved people; maintaining law and order in the face of black marketeering, looting, and widespread scapegoating (including scapegoating of the agencies of control themselves); and mobilizing large numbers of survivors for constructive roles in the adjustment process.

(4) Adjustment phase (extending one to five years beyond emergence phase). The problems of simply rescuing, caring for, and moving people around

the society will gradually recede into the background. Nevertheless, the preponderance of human effort will be devoted to mobilizing people to repair and rebuild a society afflicted by great physical, biological, psychological, and social damage. Most activity in this period will be directed and coordinated by political authorities. It is difficult, for instance, to see how the educational system could be allowed to develop on its own; or how any significant market system--governed by free prices and wages--could possibly function effectively.[9] Furthermore, this phase will enforce a general moratorium on the "good things of life"--consumer goods, relaxation, recreation, routine family life, etc.--because of the need to devote resources to restoring the nation's crippled productive capacity. Many social problems will spring from tensions inherent in a period of prolonged political mobilization (especially since this will be imposed on a society with a tradition of freedom from central political direction); other problems will spring from the conflict that will emerge as serious social cleavages (e. g., racial, religious) reappear.

(5) Recovery phase (extending several decades after the adjustment phase). During this final phase the society will devote an increasing proportion of its resources to social goals other than recovering from the destructive effects of nuclear attack. This involves the growth of greater institutional autonomy for those sectors

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[9]There is substantial scholarly controversy on this point, however; Hirshleifer, in examining economic breakdown and recovery in four "generalized disasters" (Russia in the period of war communism following World War I, the American Confederacy and its aftermath in the South, Germany during and after World War II, Japan during and after World War II), summarizes the effects on long-term recovery of policies of price controls and rationing: "...it may be regarded as a well-established generalization that, whatever the technological impact of an initial disaster upon the productive potentialities of an economy, there is likely to be a characteristic organizational response to the crisis in the form of adoption of monetary-fiscal policies of repressed inflation. At the extremity of the crisis, when the stress is at its utmost effectiveness, it would be hard to say if such a policy really worsens matters. However, in the initial response to the threat the effective use of the society's resources is likely to be impaired by a repressed-inflation policy; and, almost certainly, recovery after cessation of the external pressure will be impaired. (It must not be forgotten, however, that the damage inflicted by the source of stress will have a lasting component. Even ideal policies cannot produce instantaneous recovery, and perhaps not complete recovery at any time.)" Jack Hirshleifer, Disaster and Recovery: A Historical Survey (Santa Monica, Calif.: The RAND Corporation, 1963), p. 120.

of society--educational, economic, and so on--which will have been under political direction during the adjustment phase. The major social problems during this phase will result from the tensions arising from the movement away from a mobilization-centered society to some kind of pluralistic society. Threats to social and political stability will arise from social movements that advocate different directions of change, and from the cleavages and conflicts that accompany these movements.

Goal of the Analysis: Conditional Predictions About Social Behavior in Post-Attack Society

After making several assumptions about the hypothetical nuclear attack, I shall organize the remainder of this analysis around these phases of attack and recovery. For each phase I shall enumerate the most salient social and psychological variables that influence behavior. Discussion of each successive phase will be more speculative than that of each preceding phase, since in each case I shall have to assume that the society has passed through the preceding phases with at least minimally effective adaptation and that it can therefore cope with the demands imposed by the new phase. The analysis that follows, then, is a series of conditional predictions about the major directions of social behavior at various times in post-attack society.

Optimally, each conditional prediction that follows--e. g., the prediction that collective panic will occur in the event of nuclear attack, given the present warning and shelter arrangements[10]--should be accompanied by a statement of the degree of confidence with which the prediction is made. For, as I have indicated, some propositions about the consequences of attack and patterns of recovery are based on more reliable social-scientific knowledge than others. Unfortunately, in the present state of the social sciences, it is impossible to indicate precise probabilities or levels of confidence, especially about the type of propositions ventured in this essay. On the other hand, it is possible to give rough indications of confidence. In the material that follows I shall use the following kind of shorthand: I shall qualify with the word "probable" the propositions which are based on quite substantial research and can be accepted with considerable confidence. I shall

[10] Below, pp. 227-232.

qualify with the word "plausible" the propositions which are less solidly founded, yet do rest on fairly well established theory and research; and I shall qualify with the word "possible" statements that are consistent with general social-scientific knowledge but are more speculative in character. In this essay I shall refer to some but not all the research that has led me to apply a given qualification in each case. However, in my companion essay in this volume--"Methodological Issues in the Analysis of Nuclear Attack and Recovery"[11]--I shall examine the methodological canons by which confidence in conditional predictions about attack and recovery can be generated; in the companion paper I shall also examine further the character of the evidence on which predictions are based.[12]

Assumptions Regarding the Dimensions of the Nuclear Attack

I shall proceed under the following assumptions:

The nuclear attack will take the form of one mighty onslaught, lasting less than a day in all, probably only several hours. The warning period will range from 15 minutes to a few hours, depending on the pattern of attack and the delivery systems employed. No "second wave" of attacks will occur.

The attack will be composed only of nuclear devices. No chemical or biological weapons will be used simultaneously. No enemy invasion will accompany the attack.

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[11] Below, Chapter VI.

[12] Clearly, the distinction among "probable" (based on quite substantial research and can be accepted with considerable confidence"), "plausible" ("less solidly founded, yet do rest on fairly well established theory and research"), and "possible" ("consistent with general social scientific knowledge but are more speculative") requires a number of quantitative-qualitative discriminations and judgments among categories of evidence and modes of constructing propositions, using methodological bases which can be, as yet, only imperfectly established. While I will discuss these matters in the companion essay, I hope the need for these rough distinctions among degrees of confidence is already clear. Policy decisions requiring large commitments may depend upon the degrees to which propositions may be deemed forecasts of likely events, problems, or ranges of event or problem. At the same time, however, the limitations in the present state of the social sciences do not eliminate the needs of policy planners and analysts for various orders of information derived from the social sciences.

The magnitude of the attack will be between 3,000 and 10,000 megatons.[13]

Most of the megatonnage will be dropped on missile sites, airfields, and other strategic locations, but at least 1,000 megatons will be dropped on metropolitan centers. A number of devices of the 10-20 megaton range will score hits on metropolitan centers, causing heavy casualties, scattering of debris, and uncontrolled fires.

Most of the megatonnage dropped on metropolitan areas will take the form of surface blasts, so that fallout will pose serious dangers to life for several weeks.

The attack will take a toll of dead in the neighborhood of 60-90 million persons, and a toll of injured in the neighborhood of 20-40 million persons. For purposes of analyzing the social and psychological determinants of behavior, it is not necessary to pin-point the number of casualties more precisely.[14] It should be stressed, however, that a number of places--away from both metropolitan areas and military targets--will escape damage, with perhaps only a period of shielding against fallout required.

The attack will damage housing facilities to such an extent that the housing needs of the surviving population cannot nearly be met.[15]

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[13] Thus the estimates put forth by Norman A. Hanunian in 1961 are more appropriate than those of the Holifield and Spadefork analyses, which envision attacks of 1,466 and 1,779 megatons, respectively. See Norman A. Hanunian, "The Relation of U.S. Fallout Casualties to U.S. and Soviet Options" (Statement presented to the Military Operations Subcommittee of the Committee on Government Operations of the House of Representatives, August 8, 1961), (Santa Monica, Calif.: The RAND Corporation, 1961), pp. 21-28. For some purposes of analysis, however, I shall refer to estimates derived from the Holifield and Spadefork analyses.

[14] Hanunian gives a number of specific estimates, depending on size of attacks, fission yield of weapons, proportions of surface bursts, character of shielding, etc. Op. cit.

[15] For the Holifield attack, David M. Heer has calculated that whereas 29.9 per cent of the total United States population would be killed, 27.5 per cent of the housing units in the country would be so damaged as to be unsalvageable. An additional 18.9 per cent of the housing units would have to be evacuated for major repairs, and an additional 6 per cent of the housing units would be so contaminated as to be uninhabitable for several months thereafter. Heer, op. cit., p. 253.

The attack will immobilize private automobile transportation more or less completely, mainly because of the shortage of fuel, but also because of the destroyed and rubble-strewn streets. Public rail and road transport will be crippled temporarily for the same reasons.[16] I assume, however, that the effects of this transportation crisis will not be so severe that famine and disease--resulting from inability to move food and medical supplies--will overwhelm all other aspects of adjustment, although famine might be expected in areas that do not produce sufficient food for their population (e. g., New England).[17]

Sheltering for the attack will not be markedly more adequate than it is at present. I assume, however, that existing shelter space will be stocked with supplies of food and water.

Warning and Attack Phase

Present civil defense plans call for few attempts to protect against blast effects (except for crucial governmental and military centers); however, they do call for protection against the effects of fallout. Preparations include marking existing buildings as shelters and stocking them with supplies of food and water, but only vaguely and passively encouraging families to build private fallout shelters.

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[16]After several years of research at the Stanford Research Institute, Dixon estimated that a substantial amount of the physical transportation resources would survive a massive attack, and that emergency transportation services could be resumed on a very limited basis within a week or so after the attack. Debris clearance would constitute a very serious problem, however. Harvey L. Dixon, "Effects of Nuclear Attack on U. S. Rail and Truck Transportation" (Menlo Park, Calif.: Stanford Research Institute, 1963), presented before the 18th Annual Transportation and Logistics Forum of the National Defense Transportation Association, Chicago, October, 1963. For a more complicated analysis of railroad transportation in post-attack society, see Harvey L. Dixon, Dan G. Haney and Paul S. Jones, A System Analysis of the Effects of Nuclear Attack on Railroad Transportation in the Continental United States (Menlo Park, Calif.: Stanford Research Institute, 1960).

[17]Heer, op. cit., 264-269.

If legislative support is forthcoming, the federal government will support the construction of public shelters capable of shielding a significant part of the population. These public shelters will be concentrated first in metropolitan centers.[18]

Present warning systems include two types of outdoor warning signals--an "alert" signal which instructs individuals to take action as directed via radio broadcasts by local governments, and a "take cover" signal--as well as the projected warning systems to be used indoors.[19] Plans for short-term, immediate-response, tactical evacuation of persons outside cities have been discarded as unfeasible, largely because of the short interval between warning and attack (15 to 30 minutes for ICBM's) and because of the danger of exposing evacueees to fallout after the blast. Instead, the anticipated movement of persons is by short distances (up to a mile) within cities to the most readily available shelters (plus movement of a small minority of families to private shelters). According to present notions, movement of persons to shelters can occur at two times: (1) during the period between warning and attack, which would vary from 15 minutes to several hours, depending on the type of delivery system and the adequacy of the warning system; (2) during the period immediately following the blast, when persons not debilitated by the effects of air blast, ground shock, and thermal radiation make their way to shelters before the danger from radioactive fallout becomes critical; the time permitted for movement is approximately 30 minutes to an hour, but this second type of movement cannot be expected to be very significant in heavily damaged areas.[20]

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[18] United States House of Representatives, Civil Defense--1961, pp. 6-9; see also United States Congress, Civil Defense--Fallout Shelter Program.

[19] United States House of Representatives, Civil Defense--1961, pp. 8-9; Department of Defense, Annual Report of the Office of Civil Defense for the Fiscal Year 1962 (Washington, D. C.: U. S. Government Printing Office, 1962), pp. 39-45; Office of Civil and Defense Mobilization, Personal Preparedness in the Nuclear Age (Washington, D. C.: U. S. Government Printing Office, 1960), pp. 40-41.

[20] United States House of Representatives, Civil Defense--1961, pp. 16-17, 120, 156; Samuel Glasstone (ed.), The Effects of Nuclear Weapons (revised edition) (Washington, D. C.: Prepared by the U. S. Department of Defense, Published by the U. S. Atomic Energy Commission, 1962), pp. 627-632.

A number of problems arise in connection with warning and movement to shelters. The first problem deals with public misinterpretation of warnings. On the one hand, it is desirable to inform the populace what various signals mean, and to drill them in reacting to them. On the other hand, this advance preparation may have unanticipated and unfortunate consequences in the event of an actual attack. According to Chapman's summary of findings from research on signals,

> Signals that suggest a drill rather than a real emergency, official cautions that leave unspecified the nearness of danger or the protective steps to be taken, conflicting advice, or calls to action from prestigeless or resented authorities may easily support disbelief or inaction. Studies of false alarms suggest that a complicated set of factors bears on consequent public reactions. Sometimes alerts which do not eventuate in any great danger are nevertheless not depreciated, and they may even have the effect of improving the response to alerts on later occasions; sometimes they work in a "cry wolf" fashion to evoke only apathy or anger when the next alert comes along. The crucial conditions that decide these contrasting outcomes are not at all well understood.[21]

When the warning signal is recognized but only partially understood (i.e., when large numbers of people know that some danger is approaching but do not know exactly what it is or what to do about it), they will probably engage in disruptive information--seeking behavior, such as clogging telephone lines by calling friends, newspapers, radio stations, etc.[22]

Another series of problems arises from the present distribution of shelter spaces. Centers of cities, with many more industrial and public buildings, are now

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[21] Dwight W. Chapman, "A Brief Introduction to Contemporary Disaster Research," in George W. Baker and Dwight W. Chapman (eds.), Man and Society in Disaster (New York: Basic Books, 1962), p. 11; see also Charles E. Fritz, "Some Implications from Disaster Research for a National Shelter Program," and Elihu Katz, Kenneth Kessin, John McCoy, Leonard J. Pinto, and Reid Streiby, "Public Reaction to the Unscheduled Sounding of Air-Raid Sirens in a Metropolis: a First Glance at the Data," Both in George W. Baker and John H. Rohrer (eds.), Symposium on Human Problems in the Utilization of Fallout Shelters (Washington, D. C.: National Academy of Sciences--National Research Council, 1960), pp. 145-146, 201-210.

[22] Katz, Kessin, McCoy, Pinto, and Streiby, "Public Reaction to the Unscheduled Sounding of Air-Raid Sirens ...", op. cit., p. 206.

"oversheltered" by contrast with suburban areas. Assuming widespread public recognition of and response to a warning signal, this maldistribution of shelter space may lead to two effects: (1) Relatively few suburban residents will be able to take shelter because of the longer distance required to travel from suburban homes to protective shelters; and (2) Some persons may attempt to make the move to a distant shelter by automobile. This latter effect, if at all widespread, will create traffic snarls and result in clogged streets at the time of the blast.

This last point leads to the problem of collective panic in the event of nuclear attack. One of the most striking findings of the research by the United States Strategic Bombing Survey, as well as recent disaster research, is that panic is a relatively rare occurrence in bombing and other disaster situations. Again, to cite Chapman's summary of current thinking among social scientists:

> The folklore of cataclysm frequently asserts that panic--in the sense of wild, terror-stricken behavior--is natural and commonplace. Quite to the contrary, panic has seldom been found in the study of actual disaster. The accumulated mass of interview data from survivors concerning what they themselves did during acute danger and what they saw others doing shows that behavior under the impact of tornadoes floods, wrecks, and other crises is surprisingly rational, courageous, and calm. Panic behavior has consequently come to be recognized by students of disaster as an exceptional phenomenon arising under exceptional conditions.[23]

Even for the attacks on Hiroshima and Nagasaki, Janis concluded that "overt panic and extreme disorganized behavior occurred in some local circumstances during the two atomic disasters, but it is unlikely that such behavior was widely prevalent among the hundreds of thousands who survived the atomic explosions."[24]

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[23]"A Brief Introduction to Contemporary Disaster Research," op. cit., p. 13. See also Enrico Quarantelli, "The Nature and Conditions of Panic," American Journal of Sociology, LX, 3 (November, 1954), p. 275; Fred C. Iklé and H. V. Kincaid, Social Aspects of Wartime Evacuation of American Cities (Washington, D. C.: National Academy of Sciences--National Research Council, 1956), pp. 7-8; Stanford Research Institute, Social Organization, Behavior and Morale Under Stress of Bombing (Washington, D. C.: U. S. Government Printing Office, 1953), Vol. 1, pp. 15-16.

[24]Irving L. Janis, Air War and Emotional Stress: Psychological Studies of Bombing and Civilian Defense (New York: McGraw-Hill, 1951), p. 41.

Panic, then, is an "exceptional phenomenon arising under exceptional conditions," and probably should not be expected to be widespread, even after massive nuclear attack. If, however, we examine the anticipated relations between warning, shelter, and the location of people at the time of attack, we may discover situations where these "exceptional conditions" exist in almost classic form and make the probability of panic behavior fairly high. Let me elaborate this point.

The "exceptional conditions" under which collective panic occurs are (1) the presence of an immediate, extreme danger that is perceived to be (2) ambiguous in its consequences and uncontrollable by any adaptive human action, and (3) most important, the presence of a belief that there is only a limited route to escape (or a limited time in which to escape) and that this route is closing.[25] If the escape route is perceived to be completely open, or it is perceived to be completely sealed off, collective panic will not occur.

The anticipated situation of warning and shelter-taking in the event of nuclear attack meets these classic panic conditions. Unlike the situation in Hiroshima where there was no warning whatsoever, the anticipated nuclear attack today will be preceded by 15 minutes or more of warning, and ther will be a comparable period after blast for people not debilitated to move to shelters before the period of extreme fallout danger begins. Before the blast, the problem of getting to shelters "on time" is a situation of limited access to escape, and the pressure to hurry will be enormous. Furthermore--and paradoxically--the more widely understood the warning signal and the more widely dispersed the information concerning the moment of attack, the more likely will persons be to make the frantic dash, by any means whatever, to sheltered places. After the blast, insofar as warning systems instruct persons to move to shelters and indicate that there is only a limited time to do so, a similar pattern of panic might

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[25] Quarantelli, "The Nature and Conditions of Panic," op. cit., p. 273. For a much fuller statement of these unique determinants of collective panic, cf. Neil J. Smelser, Theory of Collective Behavior (New York: Free Press of Glencoe, 1963), pp. 135-146.

result; the post-blast panic for shelters, however, is much less probable, because of the general shock, immobility, confusion, and demoralization at the sight of mass slaughter, all of which inhibit collective panic reactions.[26]

Reasoning thus, we can appreciate the truth behind Fritz' observation--based on his own research--that "if the choice is between no warning at all and a warning time that is likely to be insufficient for people to complete the recommended or practiced protective acts, the best choice may be no warning at all."[27]

If we consider the time of day of attack and the distribution of persons among different familial, occupational, and educational "role locations," the probability of disorganized, panicky behavior becomes even greater. A mid-day attack would find family members separated from one another--the husband at a work place; the children in school, and the wife either at home, or at some other work place, or travelling. A night attack would find family members together in residential units. Considering the daytime situation, we can infer patterns of behavior from the findings of disaster research. One finding is that family members generally do not take cover immediately but attempt to join the others before taking cover; or, if this is not possible, they are very likely to display generally disorganized behavior.[28] If, at the time of warning of a nuclear attack, mothers are separated from children, husbands are separated from wives, etc., it is to be expected that a significant portion of these family members will frantically attempt to join their loved ones before the attack. Furthermore, in the post-blast setting, if an isolated family member survives without debilitation, it is plausible to expect that he will attempt to search for loved ones, if this is at all possible.

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[26] Janis, Air War and Emotional Stress.

[27] "Some Implications from Disaster Research for a National Shelter Program," op. cit., p. 146.

[28] William H. Form and Sigmund Nosow, Community in Disaster (New York: Harper & Brothers, 1958), pp. 23, 26-29, 62, 67, 80, 81-82, 90; Lewis M. Killian, "The Significance of Multiple-Group Membership in Disaster," American Journal of Sociology, LVII, 4 (January, 1952), pp. 309-314; Reuben Hill and Donald A. Hansen, "Families in Disaster," in Baker and Chapman (eds.), Man and Society in Disaster, pp. 186-190.

Also, persons in formal organizations that have some assigned role in the event of attack--e. g., police, military, welfare agencies--may be torn by role-conflict, i. e., between performing their emergency duty or joining loved ones.[29]

The moment of attack and the period immediately following, then, may find many people out of doors, either clogging routes to shelters or seeking loved ones. Thus we must face the eventuality--implied by Fritz' observation--that the present warning and shelter-taking arrangements may result in more casualties than no warning at all.

How can disorganized behavior and panic be prevented during the warning and attack phase? It is essential not only that the members of the household understand the meaning of warning signals, but also that they be carefully "programmed" with alternative plans for movement to shelters, depending on the time of day of attack and the availability of shelter space. They should be instructed that in the interests of safety it may be necessary to be separated from loved ones for a period after attack under some conditions, and that dashing frantically to join loved ones may heighten the danger. Parents should be instructed--even rehearsed--for the occasions when they should move to school shelters to join children; the occasions when they should take shelter elsewhere and leave the sheltering of children to teachers; and so on. Even careful instruction in advance may not be effective in the event of an attack, since the bonds that draw family members together are often stronger than any alternative "plan" in which they might have been instructed. Even in this case, however, the general rule holds: advance knowledge, instruction, planning, and rehearsal will reduce tendencies to random, confused, disorganized, and panicky behavior.

A secondary but important set of problems in the warning and attack phase concerns the anticipation of future attacks, both in areas that have been hit and in those that have escaped damage. For purposes of this analysis I have assumed that there will be no "second wave" of attacks. From the standpoint of the psychology of

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[29] For a summary of research on this issue of role-conflict in disaster, cf. Allen H. Barton, Social Organization Under Stress: A Sociological Review of Disaster Studies (Washington, D. C.: National Academy of Sciences--National Research Council, 1963), pp. 22-72.

the surviving population, however, it is probable that after the massive onslaught those not in shelters will be gripped repeatedly by terrible fears, wild rumors of new attacks, and possibly panicky movement--based on these rumors--toward shelters.[30] After the attack, therefore, officals must continue a steady stream of authoritative information to control such rumors and fears, and must be prepared to enforce the regulations limiting the movement of population.

The Shelter Phase

In the following discussion I shall distinguish between (a) those areas that have been hit or experience sufficiently heavy fallout to require one or two weeks of sheltering and (b) those areas that escape these kinds of threats (probably non-metropolitan, non-strategic areas). Even if the exact pattern of attack were known, this distinction would of course still be inexact, for variations in winds, rain, etc., will produce changing patterns of fallout after the blast.[31]

Some of the analyses in the next several pages, especially the analyses of the undamaged areas, apply not only to the shelter phase but also to the early parts of the emergence phase which follows.

With respect to that part of the population that requires sheltering for a few weeks after the blast, it is impossible to specify fully in advance the distribution of shelters immediately after the attack (for some will have been destroyed); the distribution of people among shelters (for some people will not have reached shelters and a limited number will have gone to different shelters than anticipated); the state of health of persons in shelters; the degree and kind of communication

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[30] Stanford Research Institute, Social Organization, Behavior and Morale Under Stress of Bombing, Vol. I, p. 158.

[31] Glasstone (ed.), The Effects of Nuclear Weapons, pp. 39-41, 414-415, 458-459. For one estimate of the degrees of contamination throughout the country--specifying areas requiring no sheltering, requiring up to two days of sheltering, requiring from two days to one week, and requiring from one to two weeks--for an assumed attack of more than 5,000 megatons, see Department of Defense, Office of Civil Defense, Fallout Shelter Effectiveness: The U.S. Civil Defense Program (Washington: Department of Defense, July, 1963).

among different shelters and between shelters and work and rescue crews. All these conditions will vary widely according to the pattern of the attack and the amount of damage. It is possible only to make the following general predictions about the distinctive hardships, needs, and tasks that will face the sheltered population, the possible behavioral reactions to these conditions, and the ways, if any, to control these reactions.

The sheltered population will probably be subjected to the following needs:

(1) The need to allocate scarce food, water, and medical supplies strictly and judiciously. Even optimum stocking of shelter space calls for daily rationing.

(2) The need to care for a sizeable number of injured, ill, and dying persons. Some who make their way into shelters will have been wounded or exposed to radioactive fallout. The special way that exposed people die--an initial period of symptoms, apparent recovery, then recurrence of symptoms and probable death in the period from one week to several months after exposure[32]--will be particularly disruptive for the shelter's inhabitants. In addition to injury and illness resulting from the nuclear weapons, research has indicated that acute gastrointestinal infections (resulting from inadequate sanitation in shelters) may also pose medical problems.[33]

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[32] I refer here to the level of exposure which results in the "acute gastrointestinal syndrome" and to the hematopoietic (blood) changes. United States Congress, Biological and Environmental Effects of Nuclear War, pp. 37-38; Fred C. Iklé, The Social Impact of Bomb Destruction (Norman: Oklahoma University Press, 1958), pp. 21-22.

[33] Research Triangle Institute, Emergency Health Problems Study, by W. T. Herzog (Durham, N. C.: Research Triangle Institute, 1963). Final Report Volume I, pp. 21-27. For a study of the effectiveness in treating sick and injured persons in the shelter (excluding those suffering from weapons effects) by assigning at least one physician and some medical supplies to each shelter, cf. Research Triangle Institute, Shelter Medical Support System Study (Durham, N. C.: Research Triangle Institute, 1963), p. 3. On the general problems of organizing and managing fallout shelters, cf. Dunlap and Associates, Procedures for Managing Large Fallout Shelters (Stamford, Conn.: Dunlap and Associates, 1959); Dunlap and Associates, Physiological and Psychological Effects of Overloading Fallout Shelters (Santa Monica, Calif.: Dunlap and Associates, 1963); American Institute for Research, The Recruitment, Selection, and Training of Shelter Managers and Core

(3) The need to contain serious emotional reactions. While wartime and other research findings suggest it is incorrect to suppose that very severe psychoses, traumatic neuroses, and other such disorders will be widespread, the following circumstances will produce sustained anxiety, fear, depression, and grief: the fact that many survivors will have had the "near-miss" experience, which appears to induce severe emotional reactions;[34] the fact that many survivors will have been exposed to the sight of the dead during the attack and to the dying in the shelters;[35] the fact that some survivors will be bereaved, and will suffer the typical symptoms of denial, guilt, glorification of the lost loved one, etc.;[36] and perhaps most important, the fact that many survivors will suspect but will not know for certain whether loved ones are dead, a fact that would appear to generate extreme anxiety. Separation from and apprehension about loved ones will be especially disturbing for children.

(4) The need for information about the damage to the locale, the nation, the appropriate time for emergence from the shelter, etc.

(5) In case of a prolonged (two or three weeks) stay in a shelter, the need to sustain morale by recreation and other means. This need will diminish insofar

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(footnote 33 continued) Staffs (Pittsburgh, Pa.: American Institute for Research, 1963); American Institute for Research, Guide to Shelter Organization and Management (Pittsburgh, Pa.: American Institute for Research, 1963); Gautney and Jones, Consulting Engineers, Fallout Shelter Communications Study (Washington, D.C.: Gautney and Jones, 1962).

[34] Janis, Air War and Emotional Stress, pp. 65, 123.

[35] Ibid., p. 65; Stanford Research Institute, Social Organization, Behavior and Morale Under Stress of Bombing, Vol. 1, pp. 103-104.

[36] Erich Lindemann, "Symptomatology and Management of Acute Grief," American Journal of Psychiatry, CI, 2 (September, 1944), pp. 141-148; Robert N. Wilson, "Disaster and Mental Health," in Baker and Chapman (eds.), Man and Society in Disaster, pp. 127-128.

as it becomes possible to spend brief periods outdoors as the level of fallout radiation decreases during the later phase of sheltering.[37]

It is plausible to expect the following behavioral consequences to result from these demands on the sheltered population:

(1) Premature emergence into dangerous fallout areas. At first sight it would appear that if a person were aware that emergence would endanger his life, he would not leave the shelter. In some cases, however, this information will not be available, and even if available, it will not be accepted. In addition, if some of the needs outlined above are pressing, people may forsake the shelter despite the known danger of doing so. A threatened shortage of water, for instance, would lead to emergence and foraging; the desire to search for missing loved ones would tend to pull persons from the shelters; and finally, if internal conflict (to be discussed presently) becomes sufficiently severe, people might prefer premature emergence to the intolerable conditions of shelter existence.

(2) Prolonged apathy and uncooperativeness, especially as a response to bereavement and feared bereavement.

(3) Wild rumors, especially those concerning the amount of death and destruction and the imminence of new attacks.

(4) Internal scapegoating and conflict. A concomitant of many of the emotional reactions mentioned above--especially bereavement--is rage. This means that any conflict among persons in the shelter, including conflict between occupants and leaders, will be aggravated because of the internal psychic condition of many occupants. The possibility of the development of a situation of "warring primary groups," akin to the situation in temporary prisoner-of-war camps, should not be ruled out.[38]

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[37] Glasstone (ed.), The Effects of Nuclear Weapons, pp. 649-654; Delbert C. Miller, "Some Implications for Shelter Living Based on a Study of Isolated Radar Bases," in Baker and Rohrer (eds.), Symposium on Human Problems in the Utilization of Fallout Shelters, p. 55.

[38] Albert D. Biderman, "The Relevance of Studies of Internment for the Problems of Shelter Habitability," in Baker and Rohrer (eds.), Symposium on

How can these behavioral reactions, flowing from the special demands of shelter life, be prevented or controlled? In this case it is difficult to lay down general rules in advance, since it is impossible to specify the numbers of persons, their skills, their state of health, and so on, in the shelters.

The key factors governing the success or failure of the management of shelter life are, first authoritative leadership,[39] and second, the division of responsibility among appropriate tasks. Ideally, defense authorities should assign certain key personnel--religious, medical, as well as a general "shelter manager" who is authorized to assume a legitimate leadership role--to move to certain shelters in the event of warning.[40] This advance preparation--however imperfectly it would work out in the event of an attack--would constitute at least a step toward providing a kind of "natural" basis for leadership and division of responsibility to meet the needs of shelter life. In addition, shelters ideally should be equipped with radio equipment to receive official communications and to communicate with other shelters. Again, it is difficult to guarantee these ideal arrangements in advance, particularly if communication equipment is likely to be destroyed or damaged by an attack.

(footnote 38 continued) Human Problems in the Utilization of Fallout Shelters, pp. 41-42. For an application of the findings of research on prolonged isolation in polar regions and in submarines, cf. Rohrer, "Implications for Fallout Shelter Living from Studies of Submarine Habitability and Adjustment to Polar Isolation," ibid., pp. 22-25.

[39] In an experimental simulation of shelter conditions, J. W. Altman, et al., concluded that the presence of an effective manager increased overall adjustment to shelter life, whereas the absence of adequate leadership led to various kinds of "deviance," such as teen-age petting, gambling, etc. which produced in turn some conflict between the young and the old in the simulated shelters. Office of Civil and Defense Mobilization, American Institute for Research. J. W. Altman, et al., Psychological and Social Adjustment in a Simulated Shelter. A Research Report. (Washington, D. C.: U. S. Government Printing Office, 1960). A summary of the report, as well as the limitations on generalizing from simulated shelter conditions, appears in United States Congress, Civil Defense--Fallout Shelter Program, Part II (Volume 2), p. 4857.

[40] The federal government has made a beginning on a training program for shelter managers as well as radiological monitors. Cf. Department of Defense, Office of Civil Defense, Highlights of the U. S. Civil Defense Program (1963), p. 15 and Chart 15.

Despite this need for advance preparation, leadership and responsibility roles should not be too rigidly structured in advance of an anticipated attack, since the "legitimized" leaders might lack important qualifications that "spontaneous" leaders would possess. In short, whatever leadership and division-of-responsibility arrangements can be made should provide for a general supply of talent from which "natural" lines of authority and responsibility (i. e., geared to the unique problems of the unique shelter) can be drawn.[41]

In all likelihood, the ideal arrangements just sketched will be realized in a minority of shelter situations in post-attack society. Lacking these arrangements, it is essential that the spontaneous, informal leadership arising in shelters be instructed as to the distinctive needs and problems of shelter life. Civil defense plans call for supplying shelters with monitors and meters to determine radiation dose rates inside and outside the shelter.[42] It would also be helpful to supply shelters with instructions for taking an inventory of religious, medical, and welfare personnel within the shelter population. Such an inventory might contribute to an early crystallization of appropriate roles in the face of the emergency demands placed on the occupants of a shelter.

Three further measures will help to contain severe emotional reactions and to control disruptive behavioral responses among the sheltered population: (1) As large a portion as possible of the occupants of a shelter should be enlisted to assist in caring for injured, ill, and dying persons in the shelter, even if this creates a good deal of "make work" for them. Few things are more certain about immediate post-attack society than that a great many persons will be preoccupied with the grief, guilt, and suffering that accompanies the bereavement from family and friends and the shock of an enormous social catastrophe. Ordinarily these emotions are managed by a process of "grief work" on the part of the bereaved, which is sometimes facilitated by "acting out" feelings in legitimate social settings.[43]

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[41] For discussion of this issue of the delicate balance between leadership designated in advance and spontaneous leadership, cf. Fritz, "Some Implications from Disaster Research for a National Shelter Program," op. cit., pp. 147-149.

[42] United States Congress, Civil Defense--1961, p. 8.

[43] Lindemann, loc. cit.,

To enlist suffering persons in the task of caring for others who suffer, then, not only helps relieve the physical afflictions of the injured and ill but also helps work through the psychic afflictions of the bereaved.[44] (2) Insofar as possible, official, authoritative, and accurate information regarding the extent of disaster in the locale and the nation should be provided to the occupants of shelters. For some individuals, of course, this information will be anxiety-provoking and will become the focus of morbid preoccupation.[45] On the other hand, if authoritative information is not forthcoming, the likelihood of wild, uncontrolled rumors and fantasies increases. As a fairly general rule, fantasies and rumors that become focused on authoritative information--however grim this may be--are less likely to give rise to disruptive behavior than those that are allowed to run their course in an unstructured situation.[46] This point underlines the desirability, mentioned above, of maintaining outside communication with the sheltered population. (3) In estimating future events, such as the time of emergence from shelters, authorities should err on the pessimistic side. To hold out the promise of early emergence and then to postpone emergence once this expectation has been established creates--via the route of relative deprivation--more strain on the sheltered population than exists realistically. Furthermore, unfulfilled promises constitute one of the most general bases for outbursts of hostility toward authorities.

With regard to the part of the population remaining outside severely damaged areas or areas requiring protection from fallout, several special problems

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[44] There are also medical reasons for relying on non-medical personnel for treating radiation casualties. "Due to the fact that there is no known medical technique for effective treatment of mass radiation casualties, the advantage of using medical personnel to treat radiation casualties is of doubtful value. Most of the treatment measures which are recommended by the medical profession are within the capabilities of paramedical personnel and skilled laymen." Research Triangle Institute, Emergency Health Problems Study, p. viii.

[45] Janis, Air War and Emotional Stress, p. 246; Janis, "Discussion of Papers," in Baker and Rohrer (eds.), Symposium on Human Problems in the Utilization of Fallout Shelters, pp. 125-129.

[46] For documentation, cf. Smelser, Theory of Collective Behavior, pp. 158-161.

[47] For documentation, ibid., pp. 245-252.

will possibly arise. The first problem, which may not appear important at first glance, is to keep persons in undamaged areas from moving into and roaming through damaged and contaminated areas. This is the familiar "convergence" problem that appears after disasters. Of course, the widespread fear of fallout, as well as the immediate shortage of fuel and transportation, will tend to reduce this convergence effect. But insofar as persons outside the damaged areas are apprehensive about the life and welfare of loved ones, the pressure to converge appears, even in the face of some danger.[48] Certainly this has been the driving force behind the mass convergences on areas afflicted by natural disasters and on Hiroshima and Nagasaki after the atomic explosions.[49] Authorities near damaged and contaminated areas, then, should be prepared to take early measures to control the movement of population.

Almost immediately after the attack, citizens outside the areas requiring shelter will realize that serious local and perhaps general shortages of fuel, medical supplies, and possibly food and water, are imminent. Correspondingly, the danger of black marketeering and hoarding (the latter is a species of panic) will probably appear within a matter of days or weeks after the attack. Authorities should be prepared--in advance if possible--to appropriate and ration these commodities.

The two problems just mentioned involve the prevention of disruptive behavior. In addition, it will be necessary actively to mobilize the surviving population for present and future emergencies. The major crises of mobilization during the early months after attack will be: (1) Recruiting, training quickly, and equipping work and rescue crews to move into damaged areas, to dispose of the dead, to remove the injured, to clear transportation routes, and to distribute essential supplies.

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[48] The pressure to converge becomes greater as the danger from fallout decreases in the later parts of the shelter phase.

[49] Barton, Social Organization Under Stress, pp. 112-113; Stanford Research Institute, Social Organization, Behavior and Morale Under Stress of Bombing, Vol. 1, p. 105. The pressure to converge stems from the same personal and institutional attachments as the pressure to desert organizational roles in disaster and the pressure to emerge prematurely from the shelter, both mentioned above.

These crews will be overburdened with tasks of great urgency in the period immediately following the attack, and will require continuous replenishment. Probably most of the personnel used in this sort of work will be men. (2) Receiving the initial trickle of early evacuees and preparing to receive the flood of anticipated evacuees in the coming weeks as persons emerge from shelters in great numbers. This will involve preparation of motels, public buildings, schools, gymnasiums, etc., as temporary billeting quarters; making an inventory of households to receive evacuees, especially orphaned children. Presumably the greatest portion of this work can be performed by women.

The flood of pressures on all sectors of the population during the month following the attack will create one compelling, overriding need for post-attack society: the need for central coordination of rescue and relief of persons, repair of damage, and control of disruptive behavior. This need has two key aspects: (1) To coordinate different-purpose organizations--e. g., military, fire-fighting, medical, construction, etc. Disaster research has shown that the effectiveness of these organizations depends on unambiguous and authoritative communication among them, sometimes via a central coordinating agency.[50] Otherwise counter-directives, confusion, competition among organizations, conflicts of jurisdiction, and other debilitating effects are likely to develop. (2) To direct local community activity from a central source. Some central--probably national--intervention will be necessary, simply by virtue of the fact that many local and state governments will have been destroyed. In addition, it appears from disaster research that local authorities, even if intact, are unable to handle serious crises. Barton lists two tentative lessons emerging from this research:

> Local government frequently is unable to cope with the overload of problems, and is replaced by an improved emergency government such as a Citizens' Committee, or by authorities from state or national agencies.
>
> Very large scale disasters require major national programs; local efforts are overwhelmed and become ineffective.[51]

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[50] For a review of the literature, cf. Barton, Social Organization Under Stress, pp. 98-112.

[51] Ibid., pp. 167-168.

In the aftermath of nuclear attack--which would dwarf all past disasters--authorities in areas suffering from damage and heavy fallout cannot be expected to have survived; local authorities in areas not suffering from these effects cannot be expected to cope with the flood of problems; and local authorities cannot be expected to be aware of the overall pattern of needs of the surviving society, and must therefore be actively coordinated from a central place.

Present defense arrangements concerning federal intervention in localities in the event of nuclear attack--at least insofar as they are publicly recorded--are replete with paradoxes. On the one hand, government policy rests on the assumption that local governments will assume primary responsibility for local civil defense arrangements. According to the testimony of Assistant Secretary of Defense Steuart L. Pittman,

> I should say that we are depending on local government as the "hands and feet" of civil defense and in the event of a nuclear attack, contrary to the opinion of some, I think that there will be no substitute for the mayor and the county commissioner and the civil defense director and his communications channel and his equipment and local police and firemen being the principal tool for survival in the first few weeks of an attack, for the people in the immediate locality... there has to be a capability for communities standing on their own feet at the local level in the United States. Therefore, it is important... that we build up local civil defense organization in the ways that are now available.[52]

On the other hand, aside from some notable exceptions such as the state of Minnesota,[53] states and municipalities are at present woefully unprepared and in great need of area-wide and national coordination.[54] At the federal level, there have

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[52] United States Congress, Civil Defense--Fallout Shelter Program, Part I, p. 3081.

[53] Ibid., Part II (Volume 2), pp. 5478-5485.

[54] In a preliminary report on an ongoing study, "Organizing Municipal Governments for Civil Defense," the American Municipal Association states the following: "The study... finds serious deficiencies in local government capabilities and points to the need for civil defense programs, plans, and staff agencies which embrace and serve more than a single municipality." In a preliminary report on another study, "Intergovernmental Civil Defense Programs," the Association concludes: "Small municipalities and counties, as well as large

been in the past three years a number of executive orders assigning preparedness responsibilities to various Departments and Agencies--for example, in the event of emergency the Department of Agriculture will have primary responsibility for allocating food, the Department of Commerce for supervising production and transportation, and so on.[55] These executive orders have instructed the Departments and Agencies to coordinate their activities with local authorities. Apparently, however, the instructions have scarcely been implemented; there now exist few viable lines of cooperation between federal and local authorities.[56] Indeed, given the policy of local governmental autonomy in matters of civil defense, there is a presumption that the federal government will not interfere unduly with local efforts.[57]

(footnote 54 continued) central cities, have encountered problems which, generally, they have not solved because of resource deficiencies resulting from their particular size, organization, or the limited number of functions they regularly perform. While the problems encountered by small municipalities and counties differ both in degree and kind from those encountered by large central cities, all local civil defense programs could be strengthened by the creation of more viable area-wide civil defense units." These studies are reported in Information, Agenda, Project Summaries and Work Group Assignments for OCD Systems Evaluation Conference, November 20-22, 1963 (Durham, N. C.: Research Triangle Institute, 1963), pp. 1-2.

[55] Office of Emergency Planning, Executive Orders Prescribing Emergency Preparedness Responsibilities of the Federal Government (1963).

[56] See the preliminary work statement of the study, "Analysis of the Total CD System," conducted by the Institute for Defense Analyses and reported in Information, Agenda, Project Summaries and Work Group Assignments for OCD Systems Evaluation Conference, November 20-22, 1963, p. 31.

[57] I should limit the thrust of this general observation by noting that recent thinking and planning in the Department of Defense appears to be confronting more realistically the practical complexities in achieving effective coordination of central and local authorities. Such coordination, especially where it might involve critical support functions by local military units, requires not only the resolution of Constitutional-legal issues and basic doctrinal decisions about the scope of military support and control missions in local areas in the light of a hierarchy of mission priorities. It also requires effective appreciation in actual operations of the limitations which may exist upon the feasibilities of providing effective military and federal support. See Department of Defense Directive Number 3025.10, April 23, 1963, on "Military Support of Civil Defense," and Robert Lamson, "The Army and Civil Defense," Military Review, XLIV, 12 (December, 1964), pp. 3-12.

These paradoxes point to one of the most pressing needs in current civil defense planning. Much more specific and detailed powers of coordination must be given in advance to the federal government. Otherwise, reasoning from experiences in much more modest disasters, we may expect that local governments will be overwhelmed; and we may expect an increased incidence of disorientation, social disorder, and failure to mobilize--and consequently an inability of the society to move effectively toward more advanced stages of recovery.

The same consequences may be expected if the federal civil defense apparatus--even if adequate before attack--is destroyed by the nuclear onslaught. Therefore it is necessary to specify in advance various alternative sources of authority--regional, for example--in the event of the destruction of the central authority structure.

The need for informed, prepared, and active federal intervention is perhaps greatest with respect to the maintenance of law and order in the event of nuclear attack. According to thinking which has been influential in the recent past, "local government is the basic entity responsible for the emergency maintenance of law and order." Only if the local or state government requests federal aid, or if it is determined that local government agencies are incapable of performing control functions, is it anticpated that federal assistance will be forthcoming.[58] Military authorities, anxious to preserve their forces for combat operations, see their role as "assisting civil authority to cope with emergencies."[59] In the light of the past inadequacy of local authorities in the face of relatively modest disasters, however, it is imperative that responsibility for maintaining law and order be planned in advance by the federal government. This assignment of responsibility would not only be more in keeping with the realities than are the present arrangements; it would also probably reduce the need for outright martial law to be imposed

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[58] Office of Civil and Defense Mobilization, The National Plan for Civil and Defense Mobilization (Washington, D. C.: U. S. Government Printing Office, 1958), p. 12. See also Department of Defense, Office of Civil Defense, The Civil Defense System (July, 1963), pp. 18-19.

[59] Testimony of General Earle G. Wheeler, Chief of Staff, U. S. Army, United States Congress, Civil Defense--Fallout Shelter Program, Part II (Volume 1), p. 3652.

in the post-attack crisis. The greatest need for martial law would presumably arise when it became apparent that local governments were hopelessly inadequate to handle a chaotic situation. Were the situation handled from the beginning by a carefully formulated plan for federal action short of military government, this need would diminish correspondingly.[60]

The Emergence Phase

Within a few weeks after the attack, the sheltered population will be able to emerge. Fallout will have reached "safe" levels (possible long-term genetic effects aside), though many areas will still require decontamination. From the time of initial emergence through approximately the next six months all energies will have to be devoted to disposing of the dead, relocating the living, decontaminating places, rebuilding the rudiments of industry, reconstructing a transportation system, and allocating very scarce skills and resources to these ends. The major social problems will be to mobilize personnel, to maintain law and order in the face of possible looting, rioting and scapegoating; and to handle the continuing problems of mass bereavement.

Let us begin with bereavement. Mourning for the dead--which will have been a major problem from the date of attack--will continue into the emergence phase. The proportions of the anticipated national grief are staggering. Basing his estimates on the Holified attack (considerably smaller than that envisioned in this essay), Heer estimates that 16.9 per cent of the survivors will be widowed, 7.9 per cent of the surviving children will have lost both parents, and another 18.2 per cent will have lost one parent.[61] Though these percentages change in complex

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[60] Secretary of Defense McNamara declared before a Congressional Subcommittee in 1961: "The necessity for martial law bears an inverse relationship to the amount and effectiveness of pre-planning." United States Congress, Civil Defense--1961, p. 36. Two years later Assistant Secretary of Defense Pittman complained of the inadequacy of the Federal Civil Defense Act in that "we have an inadequate legal basis for giving Federal direction, as distinct from guidance, while we are under attack, except to declare martial law." United States Congress, Civil Defense--Fallout Shelter Program, Part II (Volume 2), p. 5458.

[61] Heer, op. cit., pp. 62-63.

ways under different assumptions about the size and pattern of attack, it is abundantly clear that those who will have lost at least one member of the immediate family will constitute a large minority of the survivors.

What little discussion of the dead exists in the literature on post-attack society concerns mainly the technical problems of identification and mass disposal.[62] The problem of handling the survivors' grief is not mentioned. It is evident, however, that the strain placed on religious leaders, medical personnel, social workers, as well as relatives and friends, will be enormous. They will be called upon to help millions of individuals in their "grief work." While it is obviously impossible to "plan" the most effective ways of recovering rapidly from personal tragedy--and while some might legitimately question the moral rightness of even allowing, much less helping people to forget their tragedy--it is necessary to recognize that the handling of mass bereavement will probably be one of the major social problems confronting religious leaders and others in the months after the attack.

Religious leaders will possibly play another important role in these months.[63] The kinds of social disruption resulting from massive nuclear attack will likely create many conditions--mass migration, dispossession of great numbers of people, and a challenge posed by the catastrophe to traditional religious beliefs--that are conducive to the growth of extreme, fanatic, and sometimes bizarre religious cults.[64] Many disillusioned survivors will begin to engage in a search for new bases of meaning and identity in their shaken universe. Many new sects will undoubtedly form, offering varieties of theological syncretisms to explain the tragedy that has stricken the world and the meaning of this tragedy for the human condition.

What is the role of existing religious organizations with respect to such tendencies? Insofar as individual grieving and the quest for meaning is "handled"

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[62] Stanford Research Institute, Social Organization, Behavior and Morale Under Stress of Bombing, Vol. 2, pp. 9-10, 34-38; see also the testimony of Herman Kahn in United States Congress, Civil Defense--1961, pp. 364-366.

[63] This role will extend into the years of the "adjustment" period as well.

[64] For discussion of these conditions, cf. Smelser, Theory of Collective Behavior, pp. 319-348.

within existing religious belief-systems and by established religious leaders, this will lessen the tendency to form new cults and sects; much of the despair will run its course in institutionalized channels of expression.[65] A related question is: What should be the attitude of political authorities toward the proliferation of new sects and cults, some of which may develop beliefs condemning "wordly governments"--including our own--for "bringing on" the nuclear holocaust? It is my conviction that political authorities should maintain--as they often maintained in American history--a strict distinction between the beliefs that any religious group holds and the actions it takes on the basis of these beliefs. It is essential that maximum toleration of religious beliefs be granted--for, indeed, many men and women will have to seek new bases of identity in the aftermath of the moral tragedy of nuclear war. In addition, simple repression of sects and cults tends to drive them underground, from whence they are likely to emerge in an ugly mood when the opportunity permits. Yet at the same time the political authorities must maintain strict prohibition of open political defiance in the name of religious beliefs--which has also been a theme in the history of American political reaction to religious movements. It is this combination of flexibility in the face of religious protest and firmness in the face of attempts to turn religious protest into political defiance that permits religious freedom but minimizes serious religious challenges to constitutional authority.[66]

The danger of challenges to law and order will probably be widespread during the emergence phase. The most obvious threats will come from the existence of local and perhaps general shortages--in food, fuel, housing, perhaps clothing--that will persist through these months. In cases of extreme shortages, pilfering and looting--even rioting--are difficult to control, both because of the desperation of the population and because of the deprivations of the enforcement

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[65] Historically, one of the bases for religious secessionist movements has been the incapacity of existing religious organizations to meet some new crisis of social identity of the religious membership. See H. Richard Niebuhr, The Social Sources of Denominationalism (Hamden, Conn.: The Shoe String Press, 1954).

[66] For further analysis of the control of extremist religious and political movements, cf. Smelser, Theory of Collective Behavior, pp. 325-333, 364-379.

personnel (e. g., police) themselves, which may lead them to join the disorder.[67] Even in less extreme situations violence can be stimulated and aggravated by the behavior of authorities alone. Many food riots in history have been touched off not so much by an absolute shortage of food as by unfulfilled p omises by authorities, by apparently unjust distribution, by unexplained changes in pricing and distribution, and so on.[68] In addition, if police authorities vacillate in putting down violence--which they might well do if they themselves are deprived or sympathize with the sufferings of the population--this will encourage the spread of disorder.[69] One of the most pressing needs of the surviving government, then, is to keep the military and police well stocked with necessary supplies--even at some cost to other groups in society--and to keep them under the firmest discipline.

Many arguments raised so far underscore the great need for planning, coordination, and direction by the central government in post-attack society. This need will continue through the emergence phase. The shortages of fuel, heat, housing, and medical supplies--and food and water in some localities--will require central re-allocation of limited supplies to the most stricken areas. The problems of coordinating masses of migrating survivors will overwhelm many local authorities. And the problems of mobilizing individuals for the tasks of re-establishing crucial lines of agricultural and industrial production cannot be managed through free market mechanisms or by local authorities. The central government looms large on many counts. Furthermore, the longer its parts remain debilitated from the effects of the nuclear attack, the longer may we expect demoralization, disorder, and sluggishness in mobilizing the society into the later stages of adjustment.

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[67] For an example of the difficulty in maintaining administrative controls during periods of extreme hardship, cf. Leon Gouré, The Siege of Leningrad (Stanford: Stanford University Press, 1962).

[68] For instances of this in the French Revolution, cf. George Rudé, The Crowd in the French Revolution (Oxford: at the Clarendon Press, 1959), pp. 40-43, 82-83, 63-69, 114-127, 131-141, 143-146, 162-169.

[69] For instances of this in the French Revolution, cf. H. M. Stephens, A History of the French Revolution (New York: Charles Scribner's Sons, 1886), pp. 125-126, 368-369, 386-387, 398, 400-441.

Yet the central government, even if it survives the attack or is restored to operation quickly, cannot manage everything. It cannot motivate every individual to contribute to the emergency tasks of short-term restoration; it cannot--and should not attempt to--enforce or guarantee the cooperation of every citizen. It cannot, by itself, re-integrate the whole society and handle every kind of social conflict. The center of political control must rely on supplementary institutional mechanisms to re-integrate and re-mobilize people during the period of emergence. What are these supplementary mechanisms?

The most dramatic mechanisms by which solidarity is re-established are contained in the "therapeutic community," which typically arises in the wake of disasters. Barton describes the characteristics of this striking phenomenon as follows:

> An outpouring of altruistic feelings and behavior begins with the informal mass assault and carries for days, weeks, possibly in some cases months after the impact . . . The characteristics of the therapeutic social system. . . [include]:
>
> --the reduction of social distance and social distinctions, permitting a high rate of interaction among all types of community members.
>
> --the reduction of restraints on emotional expression, and the tendency to respond to other people's expressions in emotionally supportive ways.
>
> --a high rate of participation in cooperative work to meet the needs of the community; the availability of directly meaningful activities to all members.
>
> --the allocation of goods and services on the basis of need.
>
> The result of these behavior patterns is a social environment which helps to compensate for the sorrow and stress under which many members are living with an expected abundance of personal warmth and direct help. Information about needs of community members is widely shared, there is rapid consensus on actions required to meet these needs, and highly motivated work for common purposes.[70]

[70] Social Organization Under Stress, p. 126; see also Fritz, "Some Implications from Disaster Research for a National Shelter Program," op. cit., pp. 151-152; Charles P. Loomis, Social Systems: Essays on Their Persistence and Change (Princeton: D. Van Nostrand, 1960), p. 71.

The psychological spirit of this therapeutic community--emphasizing devotion, altruism, cooperativeness, and emotional solidarity--can contribute greatly to relief and reconstruction work. Some studies indicate that this spirit can last for many months. Summarizing studies of floods, Barton reports that "long-term helping behavior arises when families in the undamaged areas voluntarily share their housing with victims evacuated from a disaster area. These evacuee-host relationships may go on for a relatively long time, far beyond the duration of the general 'therapeutic community' atmosphere."[71] Public authorities should be prepared to encourage and capitalize on this post-attack burst of potentially productive energy.

But it is important also to recognize that the waves of cooperation and solidarity fostered by the therapeutic community will probably subside and give way to bitter tensions and conflict.[72] Hosts become suspicious of their evacuees, and vice-versa; haggling over scarce supplies develops; complaints of injustice arise. I shall treat the long-term problem of handling post-crisis conflict in the next section. At present I shall merely consider the means of minimizing conflict and maximizing cooperation during the emergence phase, when relief, rehabilitation, and emergency economic activity constitute the most pressing social demands.

Kinship will continue to be a key nexus of integration during the emergence phase. Research on wartime Germany and Japan reveals that billeting of evacuees was much more satisfactory when they could make their way to some place where they had kinsmen.[73] The policy lesson from this research is that evacuees should be encouraged to join relatives wherever possible; they will then have been placed with someone they feel they can "count on" more than strangers, and this will undoubtedly reduce conflict between evacuees and hosts.

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[71] Social Organization Under Stress, p. 165.

[72] Ibid., pp. 163-165; Iklé and Kincaid, Social Aspects of Wartime Evacuation of American Cities, p. 94; Heer, op. cit., pp. 276-278.

[73] Summarized in Heer, op. cit., pp. 279-280.

Helpful as kinship ties might be in re-establishing solidarity and personal identity, however, they may possibly become dysfunctional from the standpoint of the needs for emergency mobilization in the months after attack. The "retreat into the primary group"--especially if this group constitutes the individual's only immediate source of security in the bleak, post-attack world--may motivate him not to assume various economic and social roles in the larger society which would pull him away from the kinship unit. We cannot know exactly how serious or widespread will be this conflict between the warmth of the primary group and the roles in the larger society; but it should not be ruled out as a source of tension.

In connection with this line of reasoning, I should like to discuss briefly and speculatively the role of groups other than kinship units that are important in establishing the individual's identity and sense of solidarity in times of crisis. I refer here to the ethnic and religious groupings in this country--for example, some Negro neighborhoods; some Catholic parishes; some parts of the Jewish, Greek, and Armenian communities; some Protestant churches, especially those with a fundamentalist cast, and so on. One of the possible social currents during the early months after emergence will be that disoriented people will want to fall back not only on their own kinsmen but also on "their own kind." Pressures toward "ghettoization" may develop in some of the evacuation areas as multitudes of survivors attempt to create a quasi-familial, communal social setting.

What posture should political authorities assume toward these tendencies to seek solidarity in familistic, ethnic, and religious groupings? The government should not discourage such tendencies. Moreover, even though the government should emphasize recovery as a national mission of self-sacrifice, it should be prepared to work informally through the leadership of emergent ethnic and religious groups in the hope that this leadership will provide the lever to secure the cooperative effort of minority group members in the common crisis. In this way the diffuse, integrative groups can serve an important intermediary role between government and the individual-in-family. This formula permits the existence and continuity of important security-giving groups but also provides a lever to pry individuals into emergency roles in the larger society.

I realize this last suggestion is likely to be unpopular, since a very strong ideological force in contemporary America would downgrade the differences among ethnic and religious groups and would condemn suggestions that the solidarity-potential of minority groups be used for governmental purposes. As a rule I share this idological position. But I also anticipate that the government, unable to guarantee cohesion in post-attack society by itself, is going to have to rely on every possible basis of solidarity to re-orient and mobilize a shocked population.[74]

After the crises of the emergence phase have,passed, this suggested reliance on diffuse, solidary groupings will undoubtedly extort its price. Insofar as these groupings become the basis for re-establishing cohesion, there will emerge a number of racial, ethnic, and religious cleavages of the sort that have created so many touchy political problems for American society in its recent history. In fact, we shall see presently that the adjustment phase (1-5 years after attack) will bring many delicate problems of controlling conflict that result from the appearance of such cleavages. On balance, however, I think the value of the temporary solidarity and mobilization that these diffuse, integrative groups will yield in the few months after the attack will be worth the price in conflict and tension that the society will have to pay later.

The Adjustment Phase

In the previous, emergence phase most of the surviving society's energy will have been devoted to rescuing, repairing, and distributing that part of society's "working capital" that survives the nuclear onslaught--its people, food, water, fuel, medical supplies, and housing. This emergency recuperation will have so absorbed the society that relatively few resources will have been able to go toward rebuilding productivity through fixed capital investment.

[74] In fact, it will be more important for the government to rely on diffuse, integrative groupings during the early crisis than it will be to rely on surviving specific-purpose organizations, such as organized labor, professional associations, etc. (Here I make an exception of those specific-purpose groups--Salvation Army, Red Cross, etc.--that are oriented specifically to disaster-type situations.) It is precisely in their specificity of purpose that their limitations lie. The main problems in the few months after attack will be to re-orient, re-integrate, and motivate persons in a general way; diffuse, multi-functional groupings probably serve this purpose better than specific-purpose organizations.

During the adjustment phase this balance between repair and reconstruction will shift. To be sure, the preponderance of resources will still have to be devoted to recovery in the broadest sense of the word. The adjustment phase, however, will concentrate more on rebuilding a capital base for future production. The society will have to begin to re-establish a sizeable agricultural production within months after the attack; it will have to give highest priority to rebuilding harbors and rail centers; it will have to re-establish key industries, such as petroleum and steel; it will have to invest considerably in "human capital"--training and retraining occupational groups that either were decimated by the attack or are obsolete in the face of the demands of the recovery crisis.

Lacking the appropriate knowledge and skills, I must leave to others the tasks of estimating the rate of growth, the rate of investment, and the precise pattern of investment during the five years after attack. I shall assume, however, that the rate of investment and forced saving (largely through taxation) will have to be extraordinarily high, certainly higher than any peacetime or wartime rate the society has ever seen; that the production of consumers' goods will be correspondingly dimished; and that the government will have to continue extensive price and wage controls, rationing, and direct allocation of resources in order to prevent inflation and black-marketeering and to direct resources toward the highest priority areas.[75] My objective in this section is to indicate some of the distinctively social problems of the adjustment phase, and to suggest ways in which these problems might be handled most adequately.

It is plausible to assume that the adjustment phase will see the emergence of a multiplicity of group cleavages and conflicts.[76] These cleavages and conflicts will result from the interaction of three sets of social forces--forces stemming from the values and social organization of pre-attack American society; forces stemming from the earlier emergency response to the attack itself; and forces stemming from current, pressing adjustment needs.

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[75] But, cf. Hirshleifer, op. cit.

[76] This is not to say that group conflict will be the only serious social problem during the adjustment phase. Many of the problems listed as salient in the emergency phase--such as the appearance of religious cults--may persist into the adjustment phase.

Many cleavages, already mentioned, will rise as the therapeutic community declines. The period of prolonged and unrewarded self-sacrifice will give way to a period of antagonism, suspicion, and accusation. The basic lines of social cleavage will be two: (1) The hosts vs. the evacuees. Both groups will, with good reason, feel sorry for themselves--the evacuees because they have lost their total livelihood, and the hosts because they have been asked to sacrifice so much to help the distressed. Each group may be expected to make claims that they are deserving of special recognition and privileges. This fundamental conflict between hosts and evacuees may be assimilated to several pre-attack bases of cleavage--rural vs. urban, one region vs. another, and one ethnic group vs. another. The ethnic cleavages will be the more salient insofar as the emergence phase has driven people back on their ethnic groups for identity and solidarity. (2) Members of local communities vs. outsiders. In the wake of many disasters a burst of scapegoating toward outside relief, rehabilitation, and control agencies--both private and governmental--arises.[77]

A related but distinct source of conflict is that between the reward system associated with emergency mobilization (the sheltering and emergence phases) and the reward system associated with the authoritative direction of recovery (the adjustment phase). In the earlier phases "heroes" thrive; remarkable acts of courage, such as dramatically saving lives, will command public attention, and the perpetrators of these acts will become public figures. Like many war heroes, moreover, these heroes will come to feel--and a considerable body of public opinion will support this feeling--that they should have some voice in the direction of recovery from the crisis. Yet as the emergence phase wanes, heroism loses its special value. The society now demands competent executive ability to direct resources toward recovery rather than dramtic acts of bravery. As the society moves into the adjustment phase, the heroes--and those who worship them--will likely feel "let down" or "unrecognized" by the society. Given these circumstances, it is plausible to

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[77] For example, Harry Estil Moore, Tornadoes over Texas (Austin: University of Texas Press, 1958), pp. 314-315; Form and Nosow, Community in Disaster, pp. 17-21.

expect considerable conflict between the public figures of the emergence phases and the public leaders of the adjustment phase.[78]

Still another source of conflict will arise from the resurgence of values underlying the American stratification system in pre-attack society. Many analysts have pointed out that the American stratification system is based primarily on the values of individualistic achievement in the occupational world; furthermore, American tradition holds that the individual should be able to choose his line of endeavor, and that, having chosen it, he should be able to earn his rewards by personal effort. In the eyes of many citizens these values will suffer from erosion in the adjustment phase. The government will have to recruit persons to high-priority lines of endeavor; the allocation of labor and its wages will be government-controlled to a degree unknown in American history. As the society moves into the adjustment phase, then, demands on behalf of the traditional values may be expected to appear.[79] Individuals and groups will begin to demand greater autonomy in their occupational lives and in their educational training; furthermore, they will buttress their demands by appeal to American values of individualism and achievement.

A related conflict will arise between consumer and government. A treasured value in the American tradition is that the man who earns his livelihood in the occupational world should, within limits, be able to dispose of his wealth as he sees fit. Also, American tradition holds that if a man has the money to pay for what he wants, he should have the right to purchase it. These values will undoubtedly have to be slighted in the adjustment phase. The government will probably have to withhold an unprecedented portion of the dollar in taxes; in addition, it will

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[78] This sort of conflict, while not very thoroughly studied, can be illustrated historically. In Lloyd George's call for elections just after World War I and Winston Churchill's call for elections just after World War II, both leaders attempted to capitalize on their service to the nation in wartime to gain responsibility for the direction of the nation's affairs in the ensuing period of peaceful reconstruction.

[79] In the sheltering and emergence phases, these sorts of conflicting demands will be somewhat submerged by the therapeutic social system, which minimizes social differences in the interest of meeting the common crisis.

have to assign a low priority to the manufacture of many consumers' goods because of more pressing needs. As the sense of national crisis begins to wane in the adjustment phase, then, the society may expect cries of protest from citizens in their roles as taxpayers and consumers.

Such will be some of the probable cleavages and conflicts of the adjustment phase. The government will be flooded with demands, and will be faced with an outpouring of antagonism among groups and toward itself. It will be a period in which the government, itself still damaged by the onslaught, will be sorely tried. How might the conflict and potential instability of the adjustment phase be contained? I shall mention three types of measures:

(1) The government should institute some form of compensation for the heroes and sufferers of the sheltering and emergence phases. For the heroes a system of medals akin to wartime decorations would be appropriate. For those with exceptional human and property losses a program of monetary compensation for damages might be entertained--e. g., tax relief for widows--even though the government cannot hope to make more than a token gesture. Such systems of compensation, however small they will have to be, are valuable not only because they will give due recognition to bravery and self-sacrifice in a time of national crisis; they will also probably lessen the tendency for the heroes and martyrs to seek their recognition by engaging in political conflict.

(2) The government should be firm and unyielding in the face of any overt expression of hostility--especially conspiracy and incitation to violence--which threatens law and order. At the same time, it should encourage the continuation of alternative channels of expression--free press, free speech, etc. --even though the government itself will be attacked through these channels. Again, the value of these measures is twofold: inherent, because the measures are in keeping with fundamental American traditions; and expedient, because they encourage the expression of conflict in forms that do not threaten the legitimacy of the government.

(3) The government should act to re-establish, both centrally and locally, the legislative and judicial branches of government, which have traditionally been geared to the working out of social conflicts. During the adjustment phase, as in

the earlier phases, the temptation will be to emphasize the activities of the executive branch, since so many pressing social needs will involve the mobilization and coordination of people and resources. But as the season of cleavage and conflict emerges, the need for the other branches of government to guide and stabilize the nation will become progressively more imperative.

The Recovery Phase

In considering the several decades following the adjustment phase, it is necessary to be both very general and very speculative for several reasons. First, even if no nuclear attack materializes, it is inherently difficult to generate specific predictions about American society twenty or thirty years from now; we simply cannot assume as given all the intervening social forces and unanticipated events. This difficulty is increased if a social tragedy of only partially known proportions afflicts the society in the meantime. In addition, predictions of long-term recovery from nuclear attack depend on many contingencies and assumptions about the nature of the attack and the adjustments of the immediate post-attack period.[80] For these reasons I shall limit this final section to a brief discussion of some of the institutional components of long-term recovery.

In many respects long-term recovery from nuclear attack poses the same analytic issues as long-term economic and social development in general. Both processes require an unusually high investment rate; both processes involve very extensive re-allocation of physical and human resources; and both processes create a considerable amount of social dislocation, which in turn breeds the possibility of social and political instability. Yet there are significant differences between the two types of processes as well. To illuminate these similarities and

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[80] Even in predicting the simple rate of recovery in terms of economic indices, Sidney G. Winter assumed that "the changes in agricultural practices required by contamination of farmland, the probability of severe bottlenecks in at least some industries, possible physiological and psychological effects on the efficiency of the work force, and so on "would not be problematical elements in determining the rate of recovery. United States Congress, Civil Defense--1961, pp. 325-326.

differences, I shall sketch two "ideal-type" patterns of development, then indicate how the probable pattern of economic and social recovery after a nuclear attack compares with these two patterns.

The first pattern is abstracted from the development of the Anglo-Saxon democracies of Northwest Europe and North America, especially the United States. It has the following socio-cultural ingredients: (1) The cultural background of these countries provided a rich soil for the growth of industry. In particular, the climate of ascetic Protestantism and the Anglo-Saxon legal and political framework supplied favorable conditions for the appearance of entrepreneurs and for contracting for and moving resources relatively freely. (2) Resistances to entry into the labor force required by industrial society--resistances stemming from peasant traditions, tribal attachments, etc.--were relatively weak. This statement applies especially to the United States. (3) The early industrializing Western societies, on the whole, developed their technology as opportunities and needs for industrial development arose. (4) Governmental direction of development was relatively low in the Anglo-Saxon democracies, partly because of the first two ingredients; that is, because the impetus to growth lay in cultural values, vigorous governmental action to pry individuals from their traditional attachments was not necessary. In this sense the cultural background of the West "permitted" laissez-faire government. In recent decades, which have been marked by continuing crisis--World War I, the Great Depression, World War II, and the Cold War--the government has become progressively more involved in regulating, coordinating, and mobilizing the economy.

The second pattern, contrasting with that of the West, applies to many of the countries that have more recently entered the path toward industrialization. Here I lump together Russia and China, as well as some of the developing nations in Southern and Southeast Asia and Africa.[81] (1) The cultural background does not provide a rich soil for the growth of industry. Many of the new nations have inherited very conservative religious traditions, opposed in many respects to commercial and industrial patterns. Consequently they have had to "manufacture," as

[81] For a variety of reasons I exclude Japan, the Middle East, and Latin America.

it were, a cultural background favorable to industry, in the form of vigorous nationalistic movements.[82] (2) Serious resistances to commitment to the labor force stem from traditional tribal and kinship ties in these nations. Although the problem of disciplining the labor force in the West was a major one, it has undoubtedly been a more serious obstacle to the development of the new nations. (3) The developing countries have inherited advanced levels of technology from the West by virtue of their having entered relatively late on the industrial scene. (4) Governmental direction of development has characterized the late arrivers. These countries have required strong governmental action to overcome the cultural sources of traditionalism. This feature is especially marked in the Communist countries, but it is evident also in Southeast Asia and Africa.

Such in broad outline are some of the socio-cultural factors that have conditioned the supply of capital, labor, etc. --and through these the rate of growth itself--in the history of industrialization. What will be the status of these factors in the wake of nuclear attack?[83] With respect to three aspects of the socio-cultural heritage surviving the nuclear attack, American society will have the ingredients of a rapid recovery rate: (1) The society, even though it will suffer a major moral crisis from a nuclear attack, will not lose its "cultural memory" of those values and ideologies associated with an advanced industrial way of life. The one possible qualification to this statement concerns the rise of post-attack religious movements that express mass disillusionment with capitalist or industrial society, perhaps even holding it "responsible" for causing the nuclear holocaust; such movements would no doubt be antagonistic to rebuilding such a society. (2) With respect to the labor force, there are few reasons to expect long-term resistances to assuming roles necessary for recovery. Certainly

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[82] W. W. Rostow, The Stages of Economic Growth (Cambridge: Cambridge University Press, 1960), pp. 26-35.

[83] Many economic adjustment problems will arise from the sheer quantity of destruction of the factors of production themselves--for example, if 50 per cent of the labor force in certain key industries is obliterated, or if the central banking system is destroyed. In this essay I shall not make any calculations with respect to the rates of restoration of the labor force, or the speed with which the money and credit system is restored.

there will be a very large absolute loss of life. In addition, there may be some additional loss of skills by virtue of the fact that the attack could focus on metropolitan centers with concentrations of high-level skills. Such circumstances may well lead to serious and prolonged bottlenecks. On the whole, however, the surviving population will possess a high level of skills and commitment to an industrial labor force. (3) Even if it suffers a serious nuclear attack, the society will inherit a very high level of technological knowledge. Principles of advanced production are not obliterated by an explosion, even though the shortages of the factors of production to implement these principles may slow the process of recovery.

These arguments point up a possible contrast between social dislocation in a developing society and social dislocation in a society recovering from a nuclear war. In the former most of the dislocation results from tearing individuals from traditional kinship, tribal, and religious settings and disciplining them in the values and norms of an urban-industrial labor force. This process creates serious resistances, and lies at the root of the expression of much dissatisfaction on the part of the working classes. In a society recovering from nuclear attack, however, the social dislocation, while serious, will not involve tearing individuals from one cultural context and placing them in another; this process has already been more or less completed in an advanced industrial society. Rather the dislocation will result directly from the effects of the onslaught itself and the consequent allocation of individuals to high-priority recovery goals.

Many of the major institutional problems of long-term recovery will probably arise from the degree of governmental involvement in the various institutional spheres. As indicated above, one characteristic of the American tradition is that this involvement has been relatively low--the "normal" state of affairs for the economy has been an absence of governmental intervention; the burden of proof has been on why the government has to intervene (e.g., for reasons of social injustice, or unfair competition). Similarly with other institutions, the "normal" state has been one of institutional autonomy--freedom of religion from governmental intervention, and vice-versa; freedom of public education from central government control and from religious dogma; freedom of the individual from government by virtue of his constitutional and civil rights; freedom of the press from governmental control,

etc. The demands of the post-attack world, however, will mean that--contrary to tradition--the government will very likely have to assume much more intimate guidance, regulation, and control of the non-political institutional spheres. Throughout this essay I have emphasized the need for governmental direction of relief and rehabilitation, as well as restoration of economic functions; its relations with the religious authorities in post-attack society are also likely to be closer than before the attack; and, in the rebuilding of human capital, the government will have to finance, coordinate, and direct educational institutions.

Given this tension between American traditions and the needs for recovery, the prognosis is for several decades of continued conflict concerning the proper directions recovery should take. In one institutional sphere after another--education, business, medicine, etc.--conflicts between the political and the non-political will arise. The adherents of the "political" approach to recovery will continue to stress the crisis; the adherents of the "non-political" approach will stress the need to return as quickly as possible to the "normalcy" of traditional American institutional arrangements.[84] This promise of a prolonged season of conflict underlines once more the most important need for American society, should a nuclear holocaust ever strike: the need to restore rapidly and preserve a constitutional framework--alike in essentials to the one that has guided the nation in the past--so that the survivors may more effectively resolve their conflicts and shape their destiny.

[84] The political tensions of the decades after a nuclear war will not be new ones for America. They will be reminiscent of the rushes to "return to normalcy" after World War I and World War II. But they will dwarf these earlier tensions by their duration and intensity.

Introduction to Chapter III

As a system whose traits depend directly on the existence of individuals, the human population of society could be among the first of the large scale systems of society to be markedly altered by nuclear attack. Because of the long interval required for its regeneration, the population may also be the last large system to recover its pre-attack characteristics.

In Chapter III, David M. Heer identifies three principal dimensions in which to express the vulnerability of a population to the effects of thermonuclear attack. These dimensions are population size, composition, and rate of growth.

Population Size

The population of the United States is the fourth largest in the world, after Mainland China, India, and the Soviet Union. In marked contrast to these three populations, however, the population of the United States is highly concentrated --- 53 per cent of this population lives in less than one per cent of the land area. This marked concentration of the population and the complexity of the nation's social and economic organization create a number of interacting conditions which appear to increase its vulnerability. Heer points out the ranges of ways in which a potential enemy could increase the vulnerability of the United States by taking advantage of these general population characteristics. Not only could the population be targeted in highly efficient ways, in comparison to other populations, but there is a counter option: an enemy could deliberately choose to save the large majority of the population (assuming fallout shelter), and thereby create enormous pressures on per capita consumption standards. If attack resulted in a much smaller population, however, the United States might experience other problems. One of these could be a reduction in its power position in international affairs, particularly if other larger nations were not affected by nuclear attack. In sum, any marked alteration in the population size or in the ratio of the population to critical organizational and material resources could create profound disequilibria in the American social system. Furthermore, alleviating the effects of these pressures toward disequilibrium could be a protracted process: Heer calculates that under realistic assumptions, "restoration of the

pre-attack population following an attack reducing the population to half its former level might take around 56 years". A longer time would be required to restore the relative position of the United States population, when the possible post-attack size and influence of the nation are compared to those of nations escaping attack, for the unaffected nations would probably continue growing at more rapid rates. In the absence of further research, Heer's essay must leave open an issue of potentially great importance to policy: In the long run, is a large industrial population more or less "vulnerable" to the effects of weapons targeted to population than a large non-industrial population?

Population Composition

Of more immediate importance to vulnerability reduction systems planners will be predictions of the immediate composition of the population surviving attack. Heer relies heavily on two non-classified attack patterns in lower ranges (1,466 and 1,779 megatons) to show that some previous discussions of radical changes in population composition following nuclear attack have probably been exaggerated. He freely concedes that his findings might change under different assumptions, but the relative rigor of Heer's analyses appears to warrant the attention of planners to some of his findings.[1] Heer notes that unlike previous wars, a nuclear war will probably not result in marked changes of the sex ratio in the population. He finds further that changes in the educational and occupational composition have probably been exaggerated by certain previous writers. On the other hand, Heer finds that even with relatively small attacks, there are large changes in the marital and family status of the survivors. In one attack, up to 17 per cent of the married persons might be widowed, and 26 per cent of all children might lose one or both parents. The drastic increase in orphans implies that attack will create a large and complex social welfare and emotional supportive burden. Could these needs be met by placing orphans with kin? Would the government be required to subsidize

[1] In Chapter III, Heer provides illustrative citations from his book: David M. Heer, After Nuclear Attack: A Demographic Inquiry (New York: Frederick A. Praeger, 1965). The researches reported there were done for the Office of Civil Defense, Department of Defense, under the general direction of Human Sciences Research, Inc.

kin placement or develop a system of centers for orphans? The disruption in families, probable decline in the birth rate in the years just after attack, and age-specific patterns of mortality may sharply reduce numbers of persons in the age group born just before or just after attack, in comparison with other age cohorts. It appears clear, then, that even with relatively low level attacks, change in population composition could create marked effects in and demands upon other institutional sectors of society. When these changes are reinforced by particular crises of social organization --- such as might result from the disarray of the educational system and resulting longer term lowering of levels of educational attainment in the oncoming generation of workers --- it is evident that post-attack population composition will be a critical indicator of the ability of the society and its planners to maintain pre-attack standards of viability in both the short and long term.

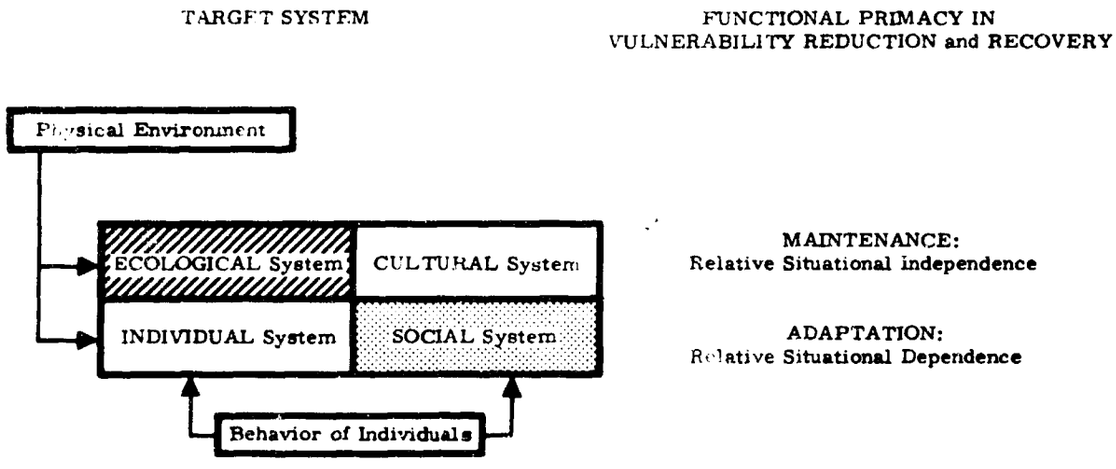
Rate of Population Growth

Social countermeasures against vulnerabilities created by nuclear attack may take on new meanings, from the perspective of problems created by restoring appropriate rates of post-attack population growth. It is to be expected that any attack will produce substantial initial population losses and declines. Decreased fertility and increased mortality rates will keep this smaller population growing more slowly than unaffected nations. Heer foresees that planners may wish to subsidize birth rates, even while moving with maximum effort to reduce death rates. Subsidization of the birth rate may be an important drain on scarce resources, and it may accompany new patterns of social organization for children, including day care centers for younger children and new forms of educational institutions for older children. Here further dilemmas may be introduced, for the outflow of resources to support increased birth rates may come at a time when the society needs more workers entering its labor force, yet needs to maintain the decreased population of older children in school. In measures to preserve and recreate desirable patterns of population composition and needed rates of population growth, countermeasure designers confront potentially formidable problems of "tradeoff" among policies and systems.

As Figure IIIa-1 indicates, Heer's primary analytic emphasis is upon the ecological system --- as studied through its human population. His secondary emphasis is upon the social system, which provides the concrete institutional and social structural patterns which will organize individuals into the social relationships that define and affect measured values on the three dimensions of population vulnerability. Heer's essay is the first in this volume to consider in detail the general dimensions of a particular system which will be critical in mediating and reflecting social responses to thermonuclear attack.

Figure IIIa-1

PRIMARY TOPICAL EMPHASES OF CHAPTER III



Chapter III

DEMOGRAPHIC ASPECTS OF VULNERABILITY AND RECUPERATION FROM NUCLEAR ATTACK

David M. Heer
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A nuclear war could have certain profound effects on the population of the United States. In this paper we shall consider what these effects might be. We shall also try to specify the possible social and economic consequences of demographic changes following nuclear attack and thereby clarify what further changes would be necessary to achieve demographic recuperation. Finally, we shall attempt to indicate the length of time which might be required for such recuperation under varying conditions. We shall consider three aspects of population: (1) size, (2) composition, and (3) rate of growth.

I. Population Size

Some Possible Gross Attack Effects on Population Size

As of today the United States has a population of approximately 190 million and from this standpoint is the fourth largest nation in the world. The largest, China, has approximately 750 million persons; the second largest, India, approximately 450 million; the third largest, the USSR, 225 million. If an all-out nuclear attack were to occur in the near future, the size of the United States population would, of course, be reduced dramatically. For example, assuming an all-out attack to occur in 1970, when the population of the United States would probably total 210 million, the U.S. Office of Civil Defense has estimated that there would be 144 million fatalities in the absence of fallout

shelter or other civil defense measures.[1] Why would the United States suffer such high fatalities from an all-out nuclear attack? One reason is that the population of the United States is very heavily concentrated in and around its cities. The U.S. Bureau of the Census defines an urbanized area as a city of 50,000 persons or more plus its surrounding densely settled urban fringe. These urbanized areas contain less than one percent of the nation's land area but over 53 percent of the nation's population. (See Figures III-1a, and III-1b, pp. 267-268.) The U.S. Bureau of the Census defines a Standard Metropolitan Statistical Area, in general, as a county containing a city of 50,000 or more plus surrounding counties, if any, of metropolitan character and integrated with the county containing the central city. Standard Metropolitan Statistical Areas in the United States constitute less than nine percent of the nation's land area but 64 percent of the population.[2] The payoff to the enemy from destroying these metropolitan areas with their heavy concentration of military and industrial targets would be so much greater than from destruction at random that these areas would undoubtedly be the focus of any all-out enemy attack.

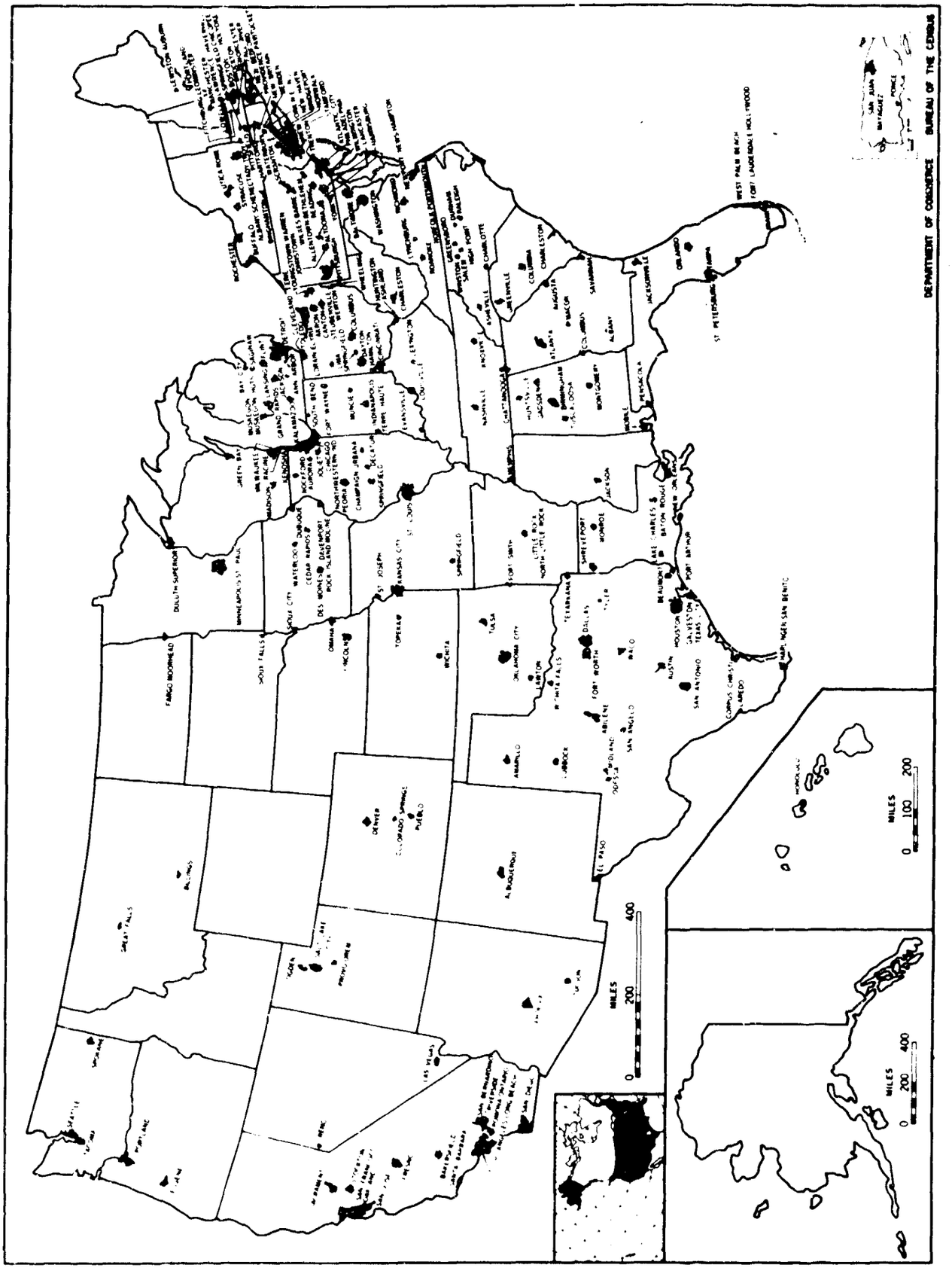
Of course, it is also possible that nuclear attack will not be a total attack but only limited attack. For example, it is plausible to assume that nuclear attack might consist solely of the obliteration of New York City by the Soviets and of Moscow by the United States. Such an exchange of blows, although terrible in its human consequences, would not have a very severe impact on the size of the United States population because the total population of the New York urbanized area is less than eight percent of that of the United States as a whole. However, such an attack affecting only the New York area might have important effects on the population composition of the nation and we shall want to discuss these possible effects later.

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[1] United States Department of Defense, Office of Civil Defense, Fallout Shelter Effectiveness - The U.S. Civil Defense Program (Washington: U.S. Department of Defense, July, 1963), p. 15.

[2] U.S. Bureau of the Census, U.S. Census of Population: 1960, Volume I, Characteristics of the Population (Washington: U.S. Government Printing Office, 1964), pp. 3, 40, and 111.

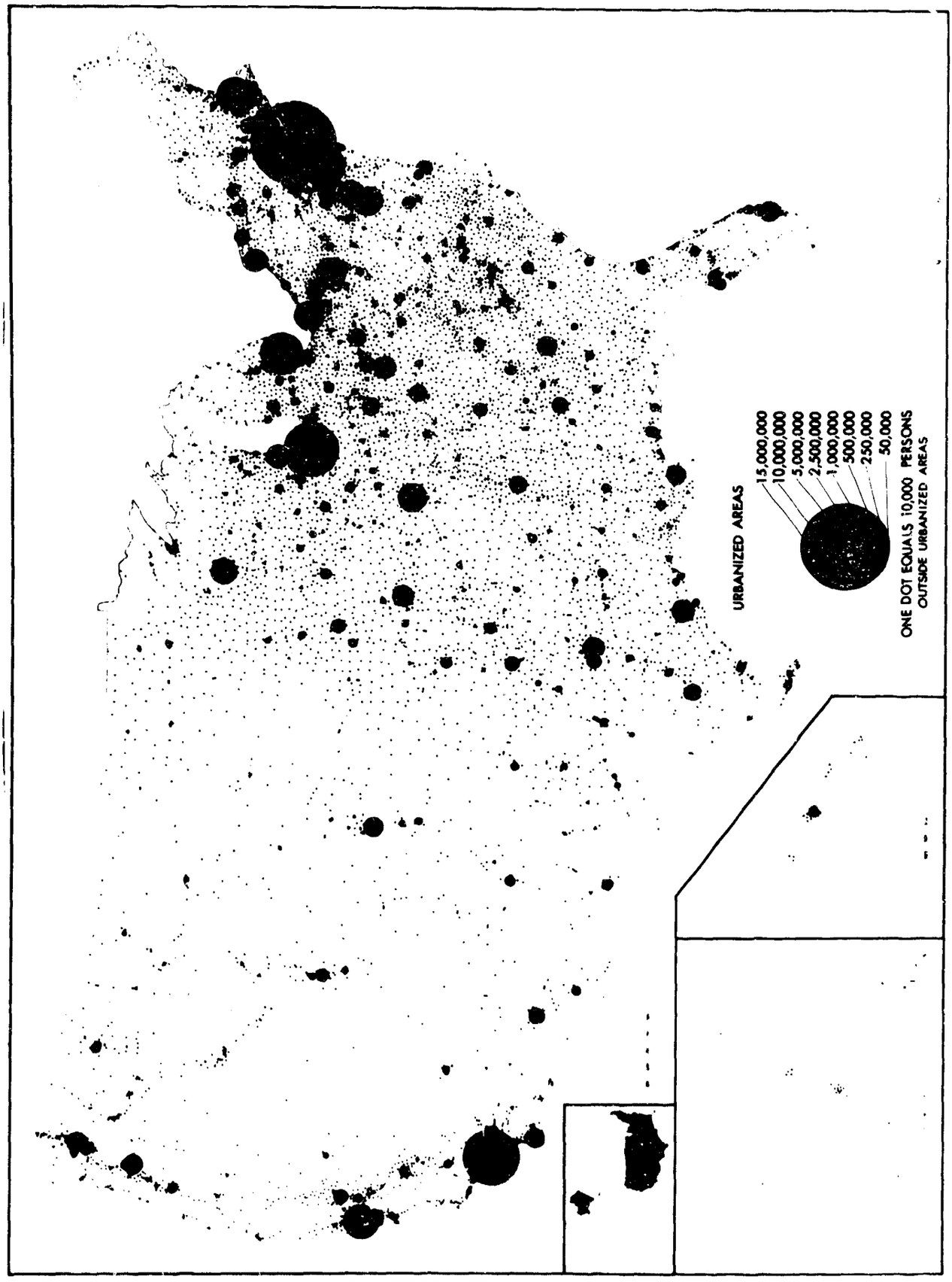
Figure III-1a
URBANIZED AREAS, 1960



Source of Figure:
U. S. Bureau of the Census, U.S. Census of Population: 1960, Volume I, Characteristics of the Population (Washington: U.S. Government Printing Office, 1964), p. S-5.

Figure III-1b

POPULATION DISTRIBUTION, 1960



Source of Figure.

U. S. Bureau of the Census, U.S. Census of Population: 1960, Volume I, Characteristics of the Population (Washington: U. S. Government Printing Office, 1964), p. S-17.

Relations Between Demographic and Economic Effects: Some Issues

An important component of the nation's internal welfare is the level of per capita income. How might this be affected by such a reduction in population size? We speak now of the period following the worst years of post-attack crisis when the economy had been at least partially restored. Economists and demographers consider that population size generally has two major effects on income per capita. The first relates to the amount of natural resources and capital equipment available per person. The second relates to the economies or diseconomies inherent in a particular scale of production.

Assuming that a nuclear attack reduced population drastically but did not reduce the amount of natural resources or capital equipment, the consequence of such an attack would be a reduction in the ratio of persons to natural resources and capital. A reduction in this ratio would then decrease the marginal and average costs of production. The marginal and average costs of land and mineral resources would decline since the poorer and less accessible resources would no longer have to be used. Hence, under this condition, a reduction in population size of substantial magnitude would reduce somewhat the cost of such commodities as oil, iron and other metallic ores, coal, agricultural products, and so forth. Other things being equal, these reductions in cost would lead to an increase in income per capita. Furthermore, the reduction in population relative to the amount of capital equipment would allow for the use of only the newest and most efficient equipment and hence, ceteris paribus, also lead to an increase in per capita income.

However, to assume that nuclear attack would reduce population size without reducing the quantity and quality of natural resources or capital is, of course, not a realistic assumption. For example, it is quite possible that much of the nation's agricultural land may be lost to cultivation for a very long time period because of its excess radioactivity. Furthermore, fires resulting from nuclear attack may destroy large portions of our forests. Finally, a very large proportion of our capital equipment, consisting of factories, housing, schools, hospitals, transport and communication facilities, would also be destroyed.

Thus, it would be impossible to specify the effect of nuclear attack on the ratio of population to natural resources and capital having data only on the attack's effect on population and no knowledge of its impact on natural resources or capital equipment.[3] Nevertheless, it is important to note that a fallout shelter program which would help to save people but not inanimate resources would have the unequivocal effect of sharply increasing the ratio of persons to resources. How much effect this raising in ratio would have on income per capita during the post-attack period is a central topic for further study by economists.[4]

The second major effect of population size on per capita income is mediated through the effect of population size on economies and diseconomies inherent in the scale of production. Let us consider first possible diseconomies inherent in a much reduced scale of production resulting from drastic population decline. One possibility is that the population might be so reduced that the economies of mass production manufacturing would no longer be obtainable. Furthermore, it is reasonable to suppose that a substantial drop in population might lead to an increase in the cost of transporting goods and persons between different cities and between cities and rural areas. This would result if, with decreased population size, fixed transportation costs, such as the costs of maintaining highways and rail lines, remained constant despite the lower amounts of traffic. Conversely, however, it is also plausible to assume economies in intra-urban transportation coinciding with a dramatic decline in total population. Such economies might result from lessened traffic congestion, the consequent decrease in transport time, and hence, savings in wage and fuel costs.

In summary, study of the effect of a drastic reduction in population size on per capita income is most complex. Much would depend on the relative magnitude of population loss as compared with loss in natural resources and in capital

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[3] For an excellent discussion of the possible functioning of the U.S. economy following nuclear attack, see Sidney G. Winter, Jr., Economic Viability After Thermonuclear War: The Limits of Feasible Production (Santa Monica, Calif.: The RAND Corporation, 1963).

[4] See Chapter IV below by Sidney G. Winter, Jr., "Societal Recovery after Nuclear War: The Economic Dimensions".

equipment. To determine precisely the separate effect on per capita income of a specified attack pattern would necessitate a very detailed economic study. Nevertheless, it should be emphasized again that a fallout shelter program saving people but not natural resources or capital equipment might, by increasing the ratio of population to resources, result in lower per capita income during the post-attack period than a civil defense program aimed at saving resources as well as people.

Population Size and Scientific Output

A second internal consequence of a sharp reduction in population size might be its deleterious effect on scientific output. If a reduction in scientific output were to occur, we might expect further detrimental ramifications for our rate of economic growth. An obvious reason for a reduction in scientific output during the post-attack period would be that fatalities from nuclear attack would include many of the existing scientists of the nation. Furthermore, it would not be easy to support the training of new scientists in the disrupted post-attack situation. Thus we might expect the drop in the number of scientists to cause a reduction in total scientific output. On the other hand, it might be argued that the marginal productivity of the additional scientists lost as a result of nuclear attack would be less than the average productivity of the scientists who survived attack. This might be the case if at the present time the marginal output added by each extra scientist is less than that of the average scientist already working in a given field. At the present time, marginal productivity may be less than average productivity because with every added scientist, each scientist must spend more time reading the work of other scientists, more time unwittingly duplicating the work of other researchers, and hence, have less time for research that adds to the sum total of scientific output.[5]

[5] For a discussion of communication overload, see Richard L. Meier, A Communications Theory of Urban Growth (Cambridge, Mass.: Massachusetts Institute of Technology Press, 1962), pp. 60-83.

Population Size and the External Position of the United States

A sharp reduction in population size might have much greater effect on the external position of the United States than on its internal welfare. Kingsley Davis has suggested that the power of a nation in world affairs is best measured by its national income. In turn, its national income is determined by two factors, its population size and its productive efficiency.[6] In an elaboration of Kingsley Davis's work, Katherine and A. F. K. Organski suggest that there are actually three determinants of national power. To the two factors mentioned by Kingsley Davis, they add a third factor--the skill and efficiency of the nation's government.[7] Both Davis and the Organskis agree that although a large population is not a sufficient condition for a nation to be a major power in world affairs, it is very definitely a necessary condition. A major power must have not only a sufficiently large pool of young manpower to staff its armed forces but also a large enough civilian labor force to provide equipment and sustenance for its military. Granted then that population size is a major determinant of power in world affairs, how might the power of the United States be affected by a sharp reduction in population following nuclear attack? Obviously, the crucial consideration here is the magnitude of population loss sustained by other nations. If a nuclear war were to reduce the population of all the world powers in proportion to their original population, the relative power of the United States in world affairs might be little affected. On the other hand, to the extent that the population of the United States following nuclear attack should change relative to that of the other major powers, its relative power would probably also be affected. For example, assume that an attack were to take place currently, causing 100 million fatalities in the United States but with all fatalities confined to the United States,

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[6]Kingsley Davis, "Population and Power in the Free World," in Philip M. Hauser (ed.), Population and World Politics (Glencoe, Ill.: The Free Press 1958), pp. 198-202.

[7]Katherine Organski and A. F. K. Organski, Population and World Power (New York: Alfred A. Knopf, 1961), pp. 27-31.

Europe, and the Soviet Union. Under these assumptions, the size of the United States population relative to that of certain other nations would be greatly diminished, as is suggested in Figure III-2, page 274. Instead of our population being approximately one-quarter the population of China, the population of the United States would now be only one-eighth as large as the population of that country. In addition, the population of the United States, would be smaller than that of Japan, Indonesia, or Pakistan, and only slightly larger than that of Brazil. Thus, under these assumptions, the influence of the United States (and also the Soviet Union and the major European states) in the world balance of power might decline considerably.

Hypothetical reduction in total population size gives an incomplete picture of population vulnerability. In considering the position of a nation in relation to the economic power of other nations, it is instructive to consider the ways in which an industrialized population is especially vulnerable because of its industrial characteristics. The extent to which a large population has the metropolitan configuration characteristic of a modern industrial nation is an important clue to the damage which an attack directed to its cities could inflict upon it. In Figures III-3 through III-7, pages 275 - 279, the proportion of the population in major metropolitan areas for each of the ten most populous countries of the world is shown: first, through a simple, ranked arrangement of the ten countries by size; then, by dividing the group of ten into the five "more industrialized" and five "less industrialized" countries (taking per capita income as the rough measure of degree of industrialization). The close association between a high level of per capita income and high degree of concentration in urban populations will be immediately evident. Given now the heuristic assumption that attacks on these countries could be precisely targeted to eliminate exactly the whole populations of the major urban clusters in each country, the potential damage inflicted by a counter-value, counter-population attack upon a relatively highly concentrated, highly industrialized total population will be immediately and intuitively clear.[8]

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[8]On the other hand, it cannot necessarily be argued as a consequence that a very large population which is not highly urbanized or industrialized is less vulnerable to longer term demographic effects of attack than a smaller,

Figure III-2

THE ESTIMATED POPULATIONS OF THE UNITED STATES AND THE SOVIET UNION COMPARED TO THAT OF MAINLAND CHINA, PRIOR TO AND FOLLOWING A HYPOTHETICAL NUCLEAR ATTACK IN LATE 1964-EARLY 1965 CAUSING 100 MILLION FATALITIES IN BOTH THE UNITED STATES AND THE SOVIET UNION

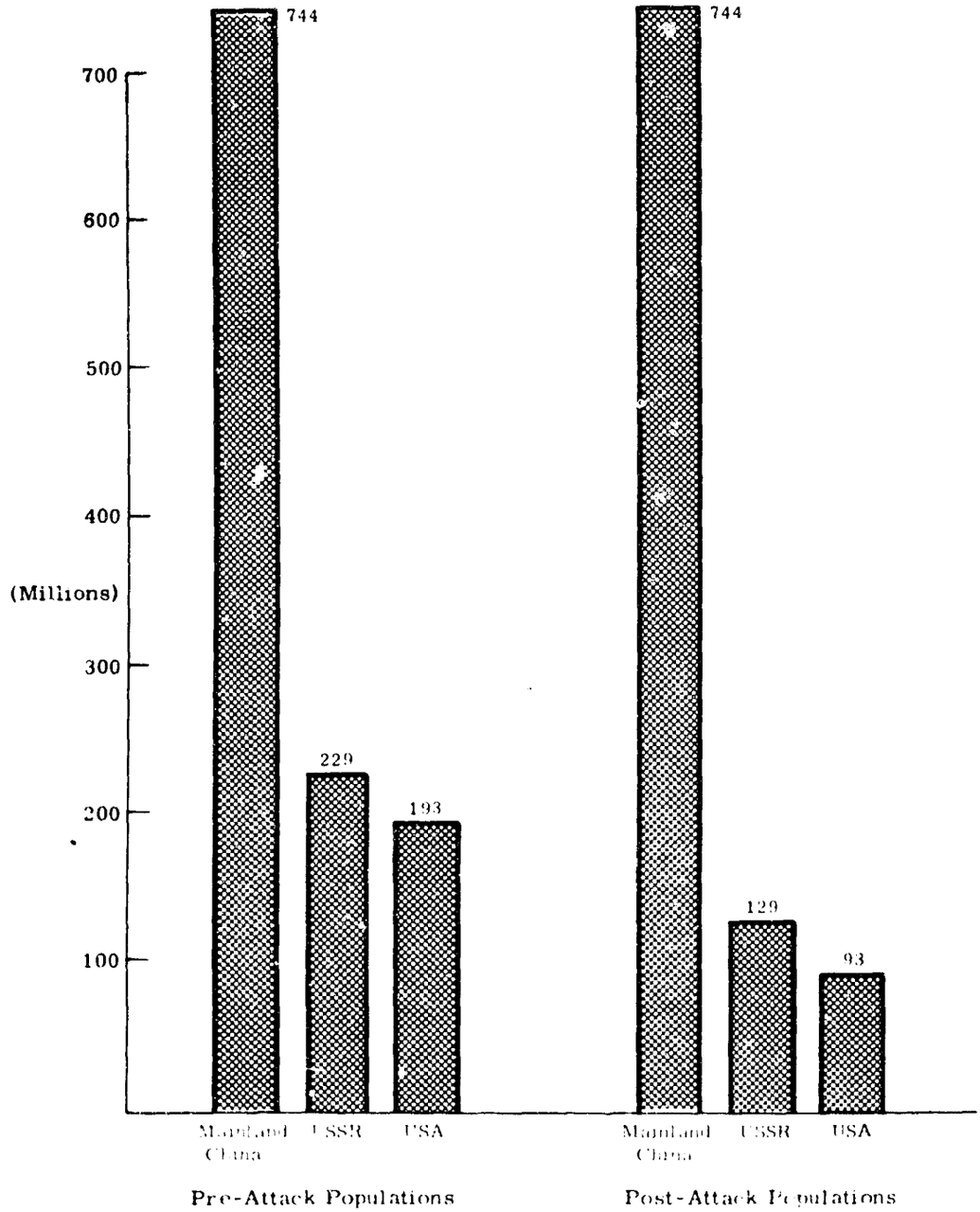
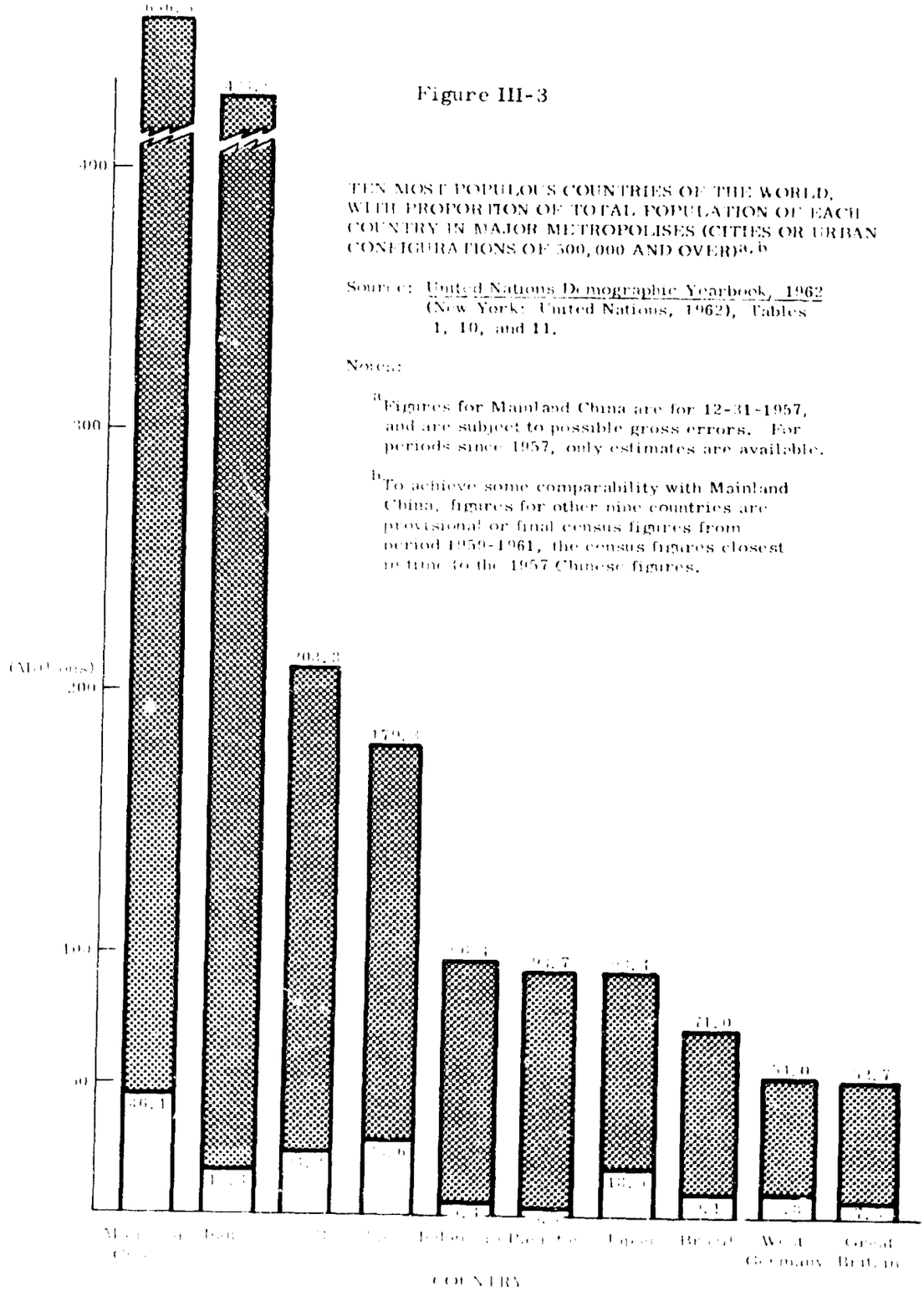


Figure III-3

TEN MOST POPULOUS COUNTRIES OF THE WORLD, WITH PROPORTION OF TOTAL POPULATION OF EACH COUNTRY IN MAJOR METROPOLISES (CITIES OR URBAN CONFIGURATIONS OF 500,000 AND OVER)[a, b]



Source: United Nations Demographic Yearbook, 1962 (New York: United Nations, 1962), Tables 1, 10, and 11.

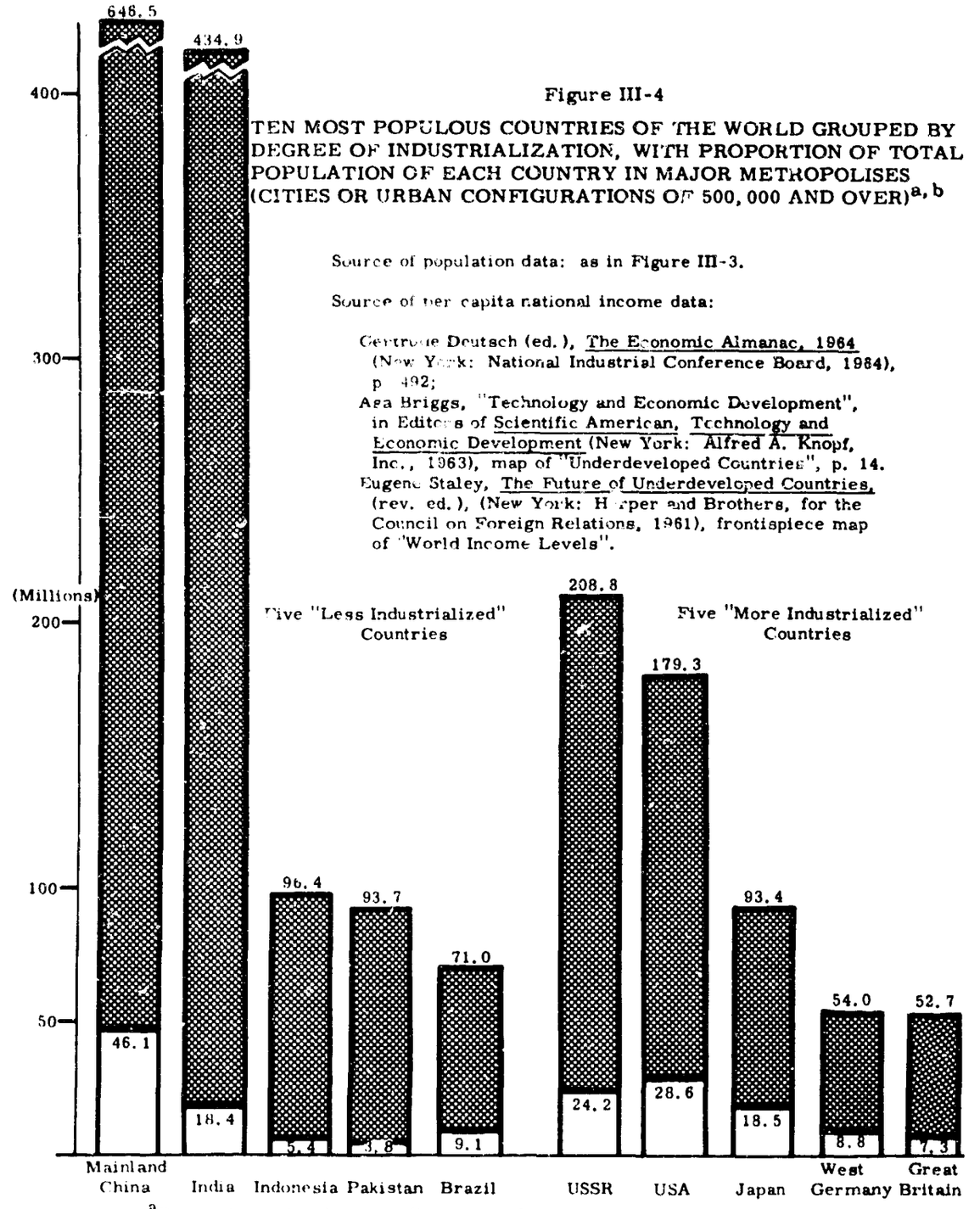
Notes:

[a] Figures for Mainland China are for 12-31-1957, and are subject to possible gross errors. For periods since 1957, only estimates are available.

[b] To achieve some comparability with Mainland China, figures for other nine countries are provisional or final census figures from period 1959-1961, the census figures closest in time to the 1957 Chinese figures.

Figure III-4

TEN MOST POPULOUS COUNTRIES OF THE WORLD GROUPED BY DEGREE OF INDUSTRIALIZATION, WITH PROPORTION OF TOTAL POPULATION OF EACH COUNTRY IN MAJOR METROPOLISES (CITIES OR URBAN CONFIGURATIONS OF 500,000 AND OVER)[a, b]



Source of population data: as in Figure III-3.

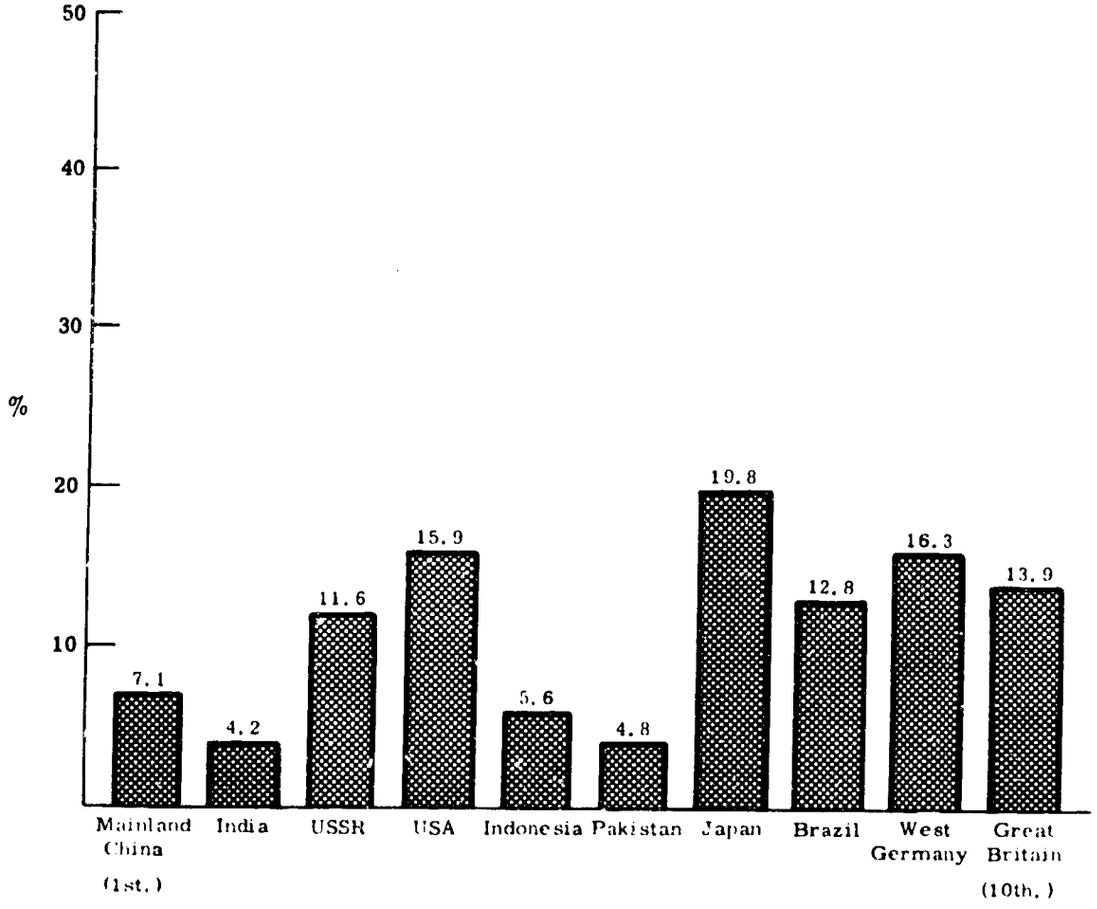
Source of per capita national income data:

Gertrude Deutsch (ed.), The Economic Almanac, 1964 (New York: National Industrial Conference Board, 1964), p. 492;
Asa Briggs, "Technology and Economic Development", in Editors of Scientific American, Technology and Economic Development (New York: Alfred A. Knopf, Inc., 1963), map of "Underdeveloped Countries", p. 14.
Eugene Staley, The Future of Underdeveloped Countries, (rev. ed.), (New York: Harper and Brothers, for the Council on Foreign Relations, 1961), frontispiece map of "World Income Levels".

[a]Per capita national income figures are for period 1957-1960.

[b]Brazil has a significantly higher per capita income figure than the other four countries in the "Less Industrialized" category, each of which has a per capita figure of "under $100". Japan, with relatively low per capita income in the "More Industrialized" category, is nevertheless a highly industrialized nation.

PERCENTAGE OF TOTAL POPULATION OF TEN MOST POPULOUS COUNTRIES OF THE WORLD RESIDING IN MAJOR METROPOLISES (500,000 AND OVER)[a]



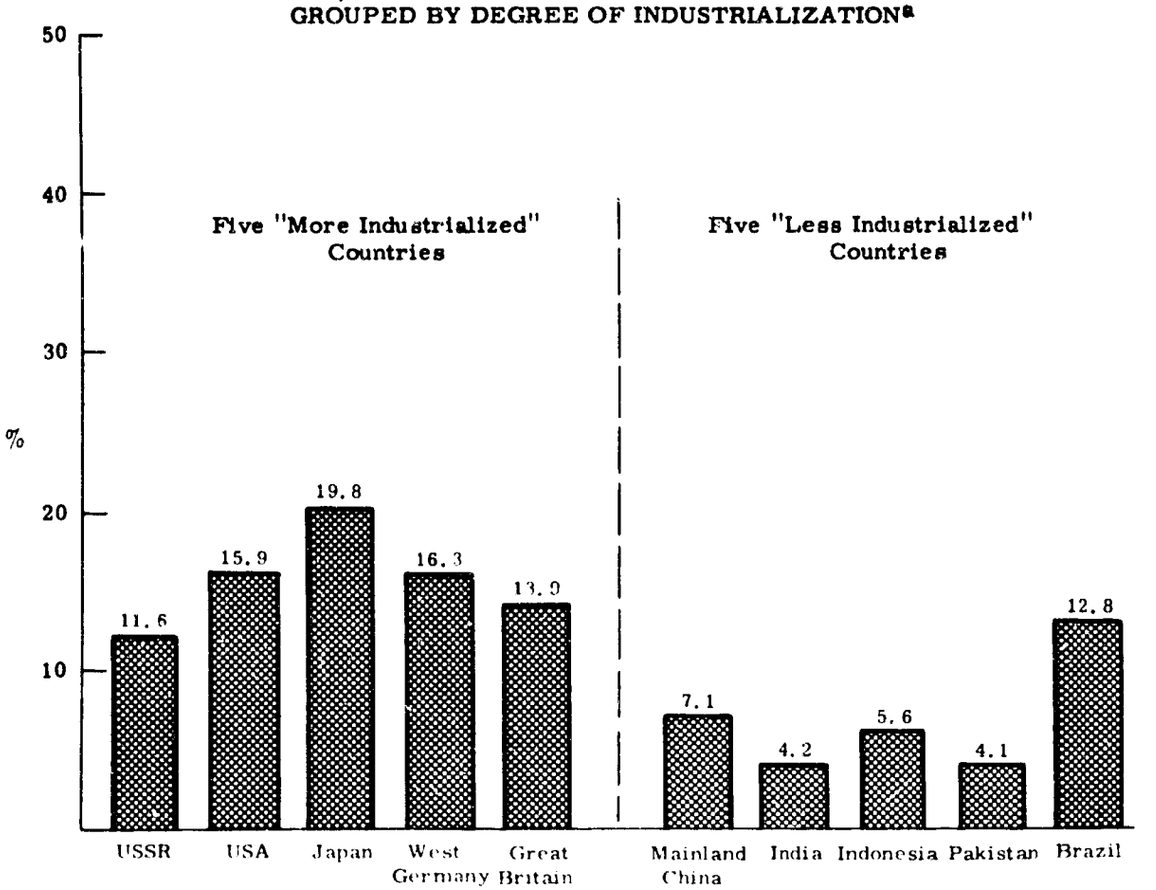
COUNTRIES, IN ORDER OF POPULATION SIZE

Source: as in Figure III-3

[a]Notes to Figure III-3 apply to this Figure.

Figure III-6

PERCENTAGE OF TOTAL POPULATION OF TEN MOST POPULOUS COUNTRIES OF THE WORLD RESIDING IN MAJOR METROPOLISES (500,000 AND OVER), WITH COUNTRIES GROUPED BY DEGREE OF INDUSTRIALIZATION[a]



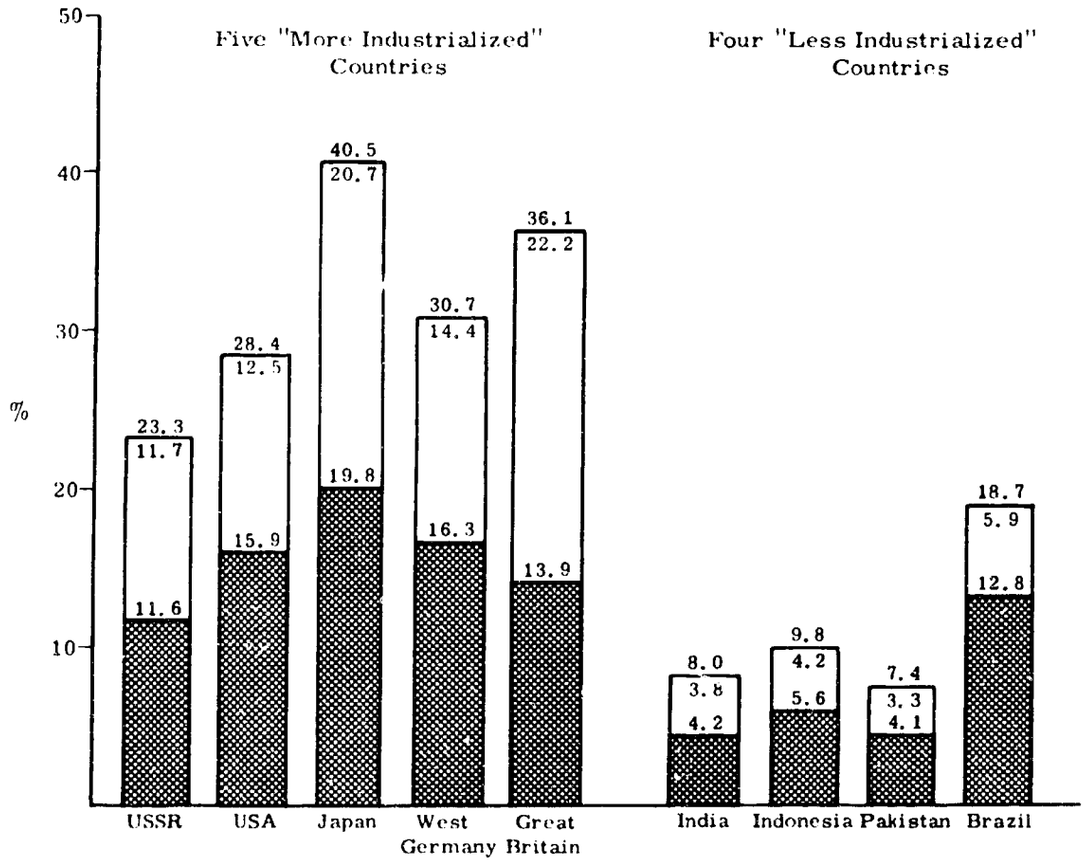
COUNTRIES, IN ORDER OF POPULATION SIZE WITHIN GROUP

Source: as in Figure III-4

[a]Notes to Figure III-4 apply to this Figure.

Figure III-7

THE PROPORTION OF TOTAL POPULATION IN MAJOR METROPOLISES (500,000 AND OVER) AND IN CITIES OR URBAN CONFIGURATIONS OF 100,000 THROUGH 499,999, FOR NINE OF THE TEN MOST POPULOUS COUNTRIES OF THE WORLD, GROUPED BY DEGREE OF INDUSTRIALIZATION[a]



Key: 500,000 and over

100,000 - 499,999

Sources: as in Figure III-4

[a]Limitations on available data require the exclusion of Mainland China from this Figure.

In contradistinction to the foregoing, it should be noted, however, that the position of the United States in world trade might be improved following a nuclear attack affecting only the United States, Europe, and the Soviet Union. If one assumes that heavy fatalities are inflicted on the United States, Europe, and the Soviet Union, and all fatalities confined to these countries, then the demand for manufactured products, which in international trade emanate primarily from these areas of the globe, might remain constant among the largely underdeveloped nations escaping attack. On the other hand, the international demand for agricultural products, originating quite largely from the underdeveloped nations not subject to attack, might be sharply reduced due to the attrition of population in the war-devastated areas. Hence the terms of trade might shift and the price of manufactured products relative to that of agricultural products might increase. Such a shift in the balance of trade would be financially beneficial to the United States and the other war-devastated nations. Such a shift might also counterbalance to some extent the possible change in U. S. power relative to that of

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(Footnote 8 continued) highly urbanized population, even though such a position has been the basis of the Chinese Communist claim that a massive nuclear war would leave the vast population of mainland China in a position of relative strength. For example, Coale argues, "Population, it appears, is a major determinant of relative strength only among countries having access to roughly equivalent technologies". Ansley Coale, "Population Research and the National Interest", in Ithiel de Sola Pool et al., Social Science Research and National Security (Washington: Smithsonian Institution Research Group in Psychology and the Social Sciences under Office of Naval Research Contract Nonr 1354(08); Task Number NR 170-379, 1963), p. 169. The question of possible differential vulnerabilities of very large populations remains an important research issue, as well as a source of potentially crucial Cold War ideological controversy. It could be hypothesized that for a given (and necessarily "lower") level of industrial development shared by both a more developed country and a less developed country, the industrial structure of the less developed country is relatively more vulnerable to the same level and type of attack directed at both countries. It could be argued that this is so because of the necessarily fewer industrial targets in the less developed country, the more critical placement of these targets in the total economy of the less developed country, and the resulting lower level of "redundant" industrial capacity and social infrastructure in the less developed country. Thus, the concentration of urban population in relatively few centers could lead to greater relative demographic and economic vulnerability in a less developed national society, when those few centers provide the principal locus of industrial development upon which the economic life of the society is becoming dependent.

nations escaping attack occasioned by the decline in United States population relative to these nations. However, making other assumptions concerning the international distribution of fatalities, shifts in the terms of trade might bring results less beneficial to the United States. For example, if fatalities were confined to the United States and the Soviet Union with Europe escaping without fatalities, the demand of the underdeveloped nations for manufactured goods could be at least partly supplied by Europe, and Europe in turn would demand a large proportion of the agricultural products and raw materials exported by the underdeveloped nations. Hence, the price of manufactured goods relative to agricultural products would be increased in much slighter degree. Because of the importance of the effects on the terms of trade which varying patterns of the international distribution of fatalities might provoke, detailed study of this topic by economists would prove valuable.

Population Size: A Preliminary Summary

We have now adumbrated some possible consequences of a substantial decrease in population size both for the internal welfare of the United States and for the power of the nation in international affairs. As is obvious, we have not been able to state that significant reduction in the size of the United States population would invariably result in given consequences relevant to the welfare of the nation; rather, we have seen that the results of significantly reduced population size following nuclear attack would depend on many other variables.

Given the inconclusiveness of our discussion concerning consequences of reduced population size, it is useful to turn our attention to the question of the amount of time necessary for the recovery of an optimally appropriate population size for the nation. If one were to accept the argument that on balance the negative consequences of a greatly reduced population size are offset by the positive, then it follows logically that an appropriate population size is already achieved immediately following attack and no time period is necessary for recovery. On the other hand, accepting the argument that population recovery would not be complete until the pre-attack population had been attained, the

necessary time period would be quite long. For example, if 100 million persons were killed out of a total population of 200 million, according to certain very rough assumptions, it would take 56 years for the population to reach 200 million again. These assumptions are that there would be no increase in population during the first ten years following attack[9] and a 1.5 per cent increase per annum thereafter. Figure III-8, page 283, illustrates recuperation of the United States population under these assumptions. Finally, suppose one accepts the argument at the other extreme, that the population of the United States would not return to normal until it was again the same proportion of the population of the world's largest country as it had been prior to attack. Accepting this argument, a very lengthy time period might be necessary for recovery. In fact, it is possible that this relative position could never be regained. To attain the same population relative to the largest country in the world would be difficult for two reasons. The obvious reason is that the great loss in United States population occasioned by by nuclear attack would have to be made up. The second reason is the likelihood that for a substantial number of years following attack, the population of the United States would show no net growth. During this time interval, the world's largest country, assuming it had been at peace, might continue to increase its population at its customary rate--in any event, at a rate higher than that of the United States.

II. Population Composition

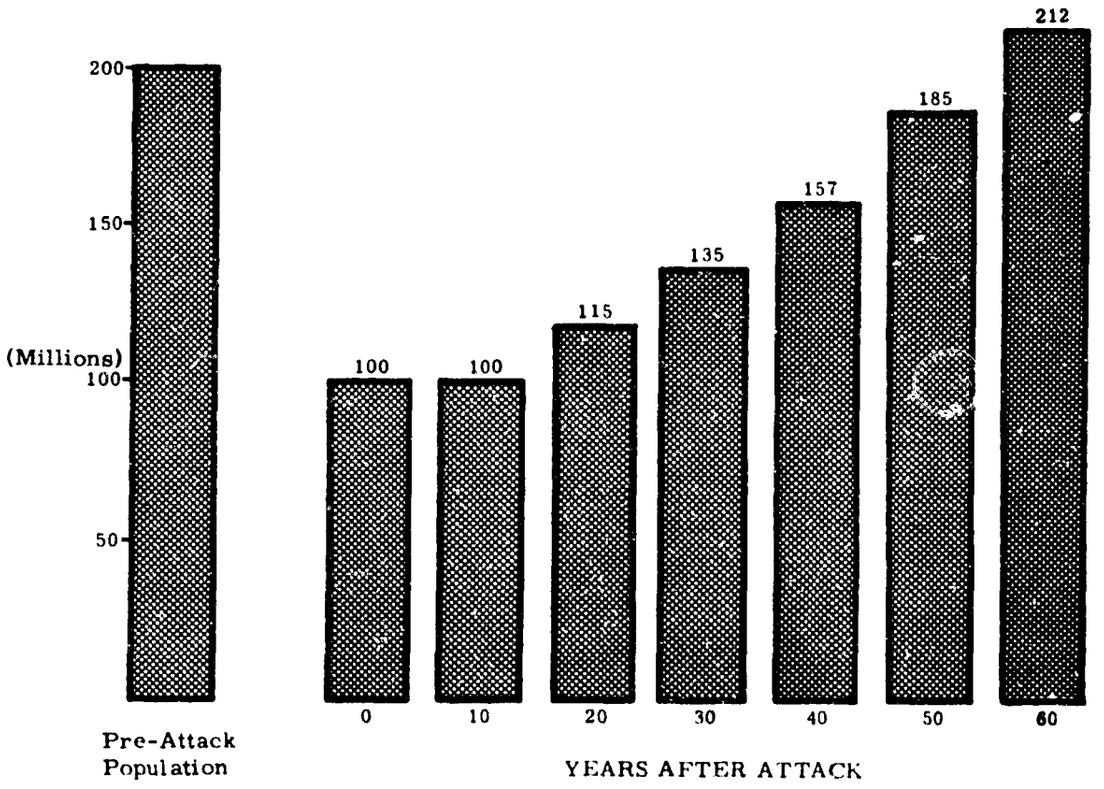
Wars often lead to major changes in the composition of a nation's population. In general, the higher the ratio of fatalities to survivors, the greater will be the change in population composition. Thus an all-out nuclear war would result in a considerably greater shift in population composition than would a limited nuclear attack limited to one or two major urbanized areas.

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[9] This assumption will be discussed in greater detail in the section of the essay dealing with population growth.

Figure III-8

ESTIMATED POPULATION OF THE UNITED STATES UNDER CERTAIN ASSUMPTIONS, DURING THE SIXTY-YEAR INTERVAL FOLLOWING A NUCLEAR ATTACK CAUSING 100 MILLION FATALITIES AMONG A POPULATION OF 200 MILLION



Distributions of Age and Sex Characteristics

In past wars, the largest changes in population composition have occurred in the distribution of the population by age and by sex. By way of illustration, we show in Figures III-9 through III-11, pages 285-287, some age-sex pyramids for Japan and the USSR in the post-World War II period in comparison with an age-sex pyramid for the United States. For example, because of wartime fatalities, in Japan by 1950 among persons 25 to 44 years old, there were less than nine men for every ten women.[10] In the Soviet Union for the same year and age group, there were less than seven men for every ten women, and among those 30 to 34 years old, only six men for every ten women.[11] Moreover, wars may affect the age and sex structure, not only through the losses of men of fighting age but also through the fact that the number of births during wartime is often markedly diminished. For example, if we look at the age structure of the Soviet Union as revealed in the 1959 Soviet Census, we see only 16 million persons 10 to 14 years old (born in 1944 to 1949) and also only 16 million, 15 to 19 years old (born in 1939 to 1943), whereas in all preceding and succeeding five-year age groups there are considerably larger numbers of persons. For example, there were 22 million persons 20 to 24 years old, and 18 million persons 25 to 29 years old.

Changes in the age and sex structure of a nation are important for several reasons. Changes in the sex structure, particularly a reduction in the ratio of males to females, make it more difficult for all of the surviving population to find marriage partners and hence tend to reduce the nation's birth rate. A reduction in the ratio of males to females will also cause a "feminization" of the nation's labor force, in which many women will be forced into jobs requiring heavy manual labor normally assumed only by men. Changes in the age structure may affect the ratio of persons in the economically productive age groups to

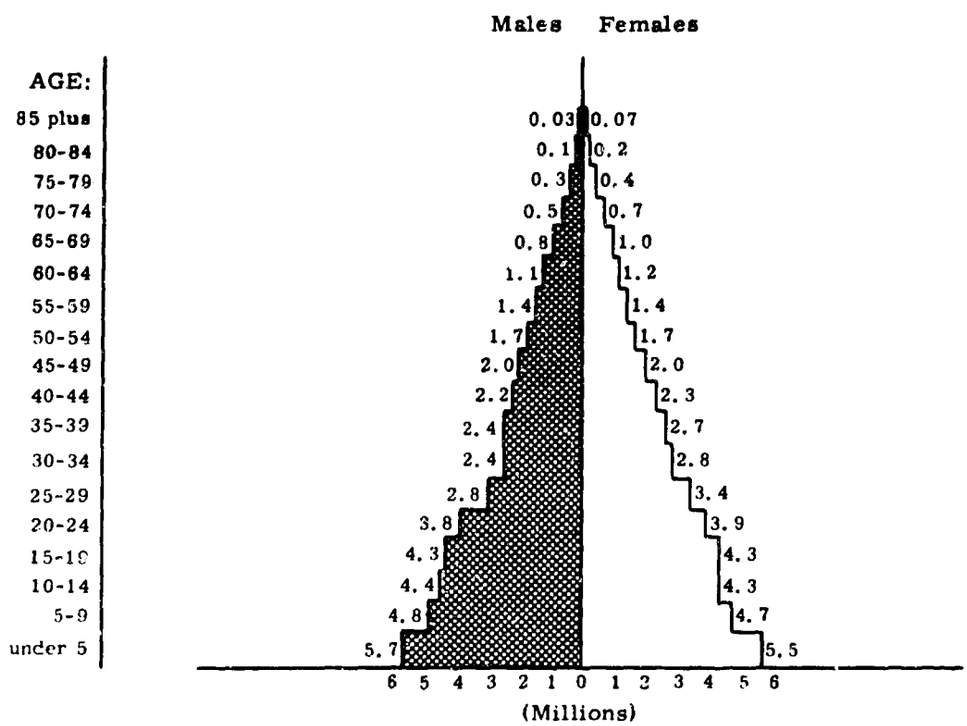
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[10] United Nations, Demographic Yearbook, 1955 (New York, United Nations, 1955), p. 248.

[11] James W. Brackett, "Demographic Trends and Population Policy in the Soviet Union," in Dimensions of Soviet Economic Power: Studies Prepared for the Joint Economic Committee, Congress of the United States (Washington: U.S. Government Printing Office, 1962), pp. 555-565.

Figure III-9

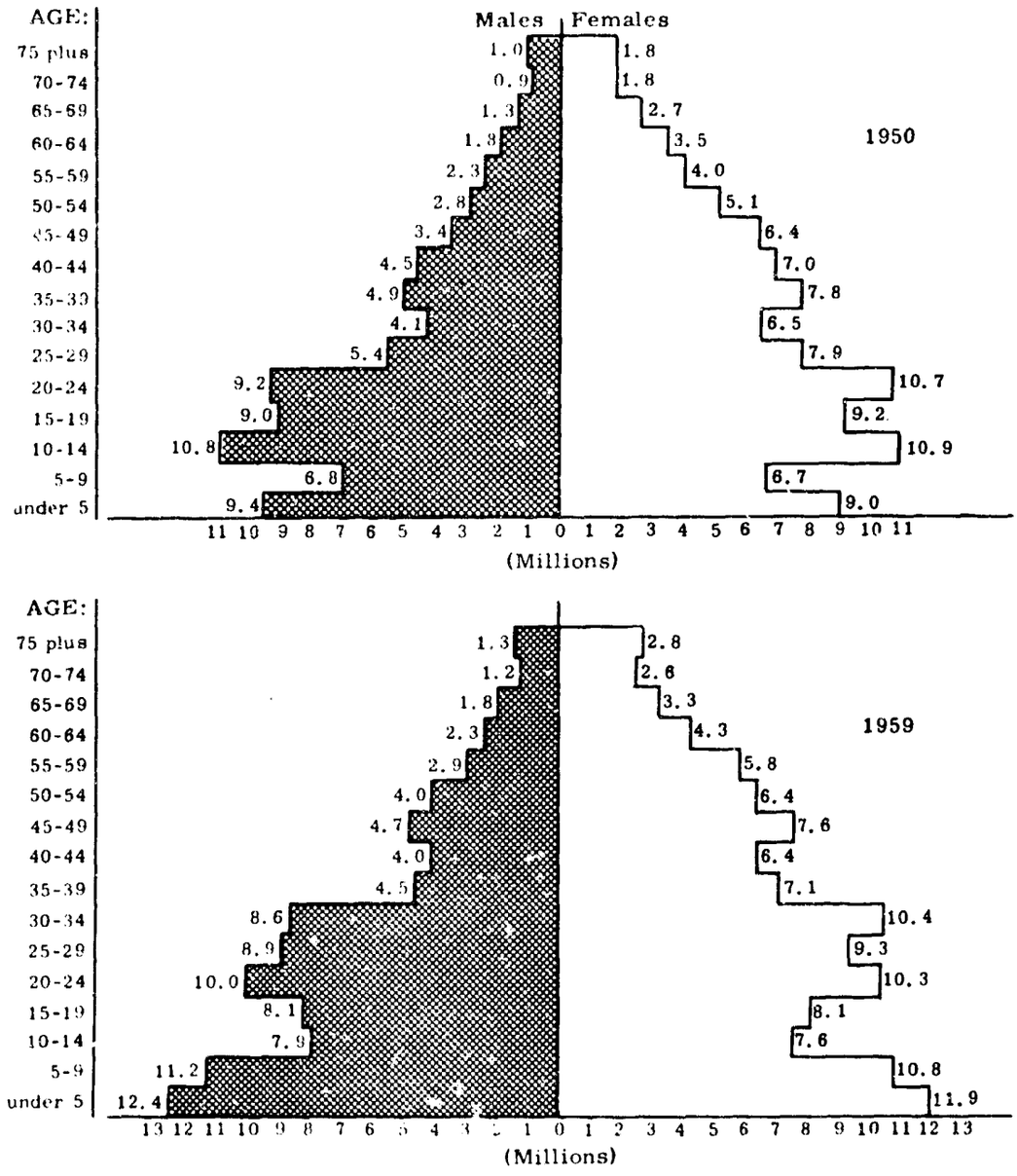
AGE-SEX PYRAMID
JAPAN, 1950



AGE-SEX PYRAMID
JAPAN, 1950

Source: United Nations, Demographic Yearbook, 1955 (New York: United Nations, 1955), p. 248.

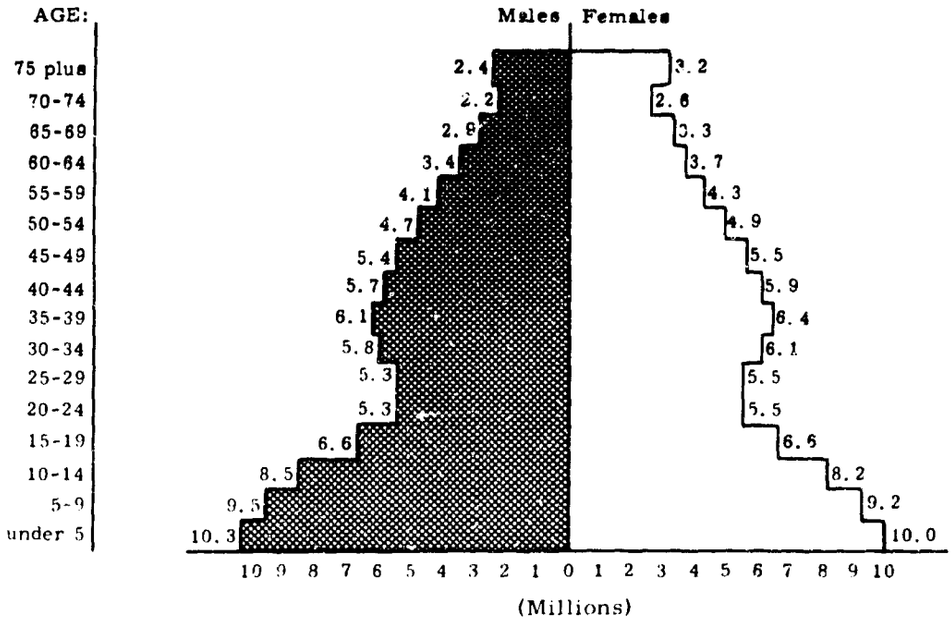
Figure III-10
AGE-SEX PYRAMIDS, SOVIET UNION



Source: James W. Brackett, "Demographic Trends and Population Policy in the Soviet Union", in U.S. Congress, Dimensions of Soviet Economic Power: Studies Prepared for the Joint Economic Committee, 87th Congress, 2nd Session (Washington: U.S. Government Printing Office, 1962), pp. 555-556.

Figure III-11

AGE-SEX PYRAMID
UNITED STATES, 1960



Source: U.S. Department of Commerce, Statistical Abstract of the United States (Washington: U.S. Government Printing Office, 1963), p. 26.

persons either too young or too old to be economically active. Changes in this ratio have a direct effect on the dependency burden which the able-bodied members of the society must assume. For example, because of the paucity of births in the Soviet Union during World War II, the ratio of dependent children to working-age adults in 1959 was reduced substantially below a normal level. Thus, in 1959, the ratio of children under 16 years of age to persons 16 to 59 years old was only .505, whereas in 1939 it had been .679.[12]

Moreover, the relative size of an age cohort also affects its employment opportunities. Members of an unusually large age cohort will have a hard time finding acceptable jobs when they reach the customary age for labor-force entrance, whereas those from cohorts which are unusually small will receive uncommon preferment. These possibilities are exemplified in the recent history of the United States. During the 1950's when the small cohort of persons born during the Depression of the 1930's came into the labor force, they received unusually high entering wages and salaries. On the other hand, those persons now entering the labor force in the mid 1960's, members of the unusually large cohort born in the aftermath of World War II, are experiencing increasing difficulty finding employment.[13]

The writer has recently completed a monographic study for the U. S. Office of Civil Defense concerning the population of the United States following two hypothetical nuclear attacks.[14] One of the objects of this study was to

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[12]USSR Central Statistical Administration, Results of the All-Union Population Census of 1959, Summary Volume (Moscow, 1962), p. 49 (in Russian).

[13]Richard A. Easterlin, The American Baby Boom in Historical Perspective (New York: National Bureau of Economic Research, 1962), pp. 29-32.

[14]David M. Heer, After Nuclear Attack: A Demographic Inquiry (New York: Frederick A. Praeger, 1965). The designation "Holifield Attack" in the following discussion refers to the fact that this attack was prepared (in 1959) by the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, U. S. Congress, when Representative Chet Holifield chaired the Subcommittee. For details, see U. S. Congress, Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, Biological

estimate the probable population composition of the United States in the immediate post-attack period. The first of these hypothetical attacks, the Holifield attack, directed at both cities and military targets, explodes 1,466 megatons of bombs and results in a 30 per cent fatality rate for the nation. The second attack, Spadefork, is directed primarily at military targets, has a megatonnage of 1,779, and produces a fatality rate of 18 per cent. A breakdown of fatalities for each of these two attacks for small geographic areas (Standard Metropolitan Statistical Areas and groupings of non-metropolitan counties) has been provided by the U.S. Office of Emergency Planning.[15] Post-attack population composition was then estimated on the assumption that within each type of geographic area, fatalities took place at random. For a summary of the findings of this study, see Tables III-1 and III-2, pp. 290 and 291.

One of the results of this study was the conclusion that nuclear war would not lead to as profound changes in age or sex composition as have conventional wars in the past. This conclusion reflected an assumption that in a nuclear war fatalities among the armed forces would not be markedly higher than among civilians. The reasonableness of this assumption is clarified when it is remembered that the Spadefork attack, aimed primarily at military targets, results in death to 18 per cent of the total United States population. Assuming no marked excess of fatalities among the military and that the number of men in the Armed Forces remains near its current small level (2.7 million men out of the approximately 17.9 million men 20 to 34 years old), one may calculate that the sex ratio would not be greatly altered nor the proportion of the total population in the age group 20 to 34 years old substantially reduced.

(footnote 14 continued) and Environmental Effects of Nuclear War, 86th Congress, 1st Session, 1959, pp. 12-55. The Spadefork Attack was prepared in 1962 by the National Resource Evaluation Center of the Office of Emergency Planning. See Office of Emergency Planning, National Resource Evaluation Center, Exercise Spadefork: Situation Analysis (Washington: Office of Emergency Planning, 1963), pp. 2-3.

[15] For further details, see ibid., pp. 13-17.

Table III-1

DISTRIBUTION OF PREATTACK POPULATION AND SURVIVORS OF HOLIFIELD AND SPADEFORK ATTACKS BY REGION, METROPOLITAN RESIDENCE, AND SIZE OF METROPOLITAN AREA FOR THE U.S., 1962
(Numbers in thousands)

	Preattack Population		Survivors of Holifield Attack[a]		Survivors of Spadefork Attack[b]	
	Total	Percent	Total	Percent	Total	Percent
U.S. Total	185,712	100.00	130,162	100.00	151,729	100.00
All SMSA's	118,284	63.69	69,535	53.42	89,699	59.00
1 million or more	61,998	33.38	36,238	27.84	48,042	31.66
Other SMSA's	56,286	30.30	33,298	25.58	41,657	27.45
Not SMSA	67,428	36.30	60,626	46.57	62,030	40.88
Northeast	46,028	24.78	26,007	19.98	37,064	24.42
All SMSA's	36,386	19.59	17,646	13.55	28,458	18.75
1 million or more	21,612	11.63	10,707	8.22	18,799	12.38
Other SMSA's	14,774	7.95	6,939	5.33	9,659	6.36
Not SMSA	9,642	5.19	8,361	6.42	8,606	5.67
North Central	53,255	28.67	42,104	32.34	43,789	28.86
All SMSA's	32,313	17.39	22,252	17.09	24,393	16.07
1 million or more	19,214	10.34	12,995	9.98	13,391	8.82
Other SMSA's	13,099	7.05	9,257	7.11	11,002	7.25
Not SMSA	20,942	11.27	19,852	15.25	19,396	12.78
South	56,654	30.50	40,243	30.91	48,116	31.71
All SMSA's	27,966	15.05	15,432	11.85	21,655	14.27
1 million or more	8,731	4.70	5,285	4.06	6,711	4.42
Other SMSA's	19,235	10.35	10,147	7.79	14,944	9.84
Not SMSA	28,688	15.44	24,811	19.06	26,561	17.43
West	29,775	16.03	21,808	16.75	22,760	15.00
All SMSA's	21,619	11.64	14,206	10.91	15,193	10.01
1 million or more	12,441	6.69	7,251	5.57	9,141	6.02
Other SMSA's	9,178	4.94	6,955	5.34	6,052	3.98
Not SMSA	8,156	4.39	7,602	5.84	7,567	4.98

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.10. (original source: National Resource Evaluation Center, Office of Emergency Planning, Executive Office of the President)

[a]Holifield Attack - 1,466 megatons, at military plus 71 major population and industrial targets, with all weapons groundburst (maximum fallout)

[b]Spadefork Attack - 1,779 megatons, at primarily military targets, with slightly over half of weapons airburst

Table III-2

PREATTACK POPULATION AND PERCENT OF SURVIVORS OF HOLIFIELD AND SPADEFORK ATTACKS BY REGION, METROPOLITAN RESIDENCE AND SIZE OF METROPOLITAN AREA FOR THE U.S., 1962
(Numbers in thousands)

Area	Preattack Population	Survivors of Holifield Attack[a]		Survivors of Spadefork Attack[b]	
		Total	Percent	Total	Percent
U.S. Total	185,712	130,162	70.08	151,729	81.70
All SMSA's	118,284	69,536	58.78	89,699	75.83
1 million or more	61,998	36,238	58.45	48,042	77.48
Other SMSA's	56,286	33,298	59.15	41,657	74.00
Not SMSA	67,428	60,626	89.91	62,030	91.99
Northeast	46,028	26,007	56.50	37,064	80.52
All SMSA's	36,386	17,646	48.49	28,458	78.21
1 million or more	21,612	10,707	49.54	18,799	86.98
Other SMSA's	14,774	6,939	46.96	9,659	65.37
Not SMSA	9,642	8,361	86.71	8,606	89.25
North Central	53,255	42,104	79.06	43,789	82.22
All SMSA's	32,313	22,252	68.86	24,393	75.48
1 million or more	19,214	12,995	67.63	13,391	69.69
Other SMSA's	13,099	9,257	70.66	11,002	83.99
Not SMSA	20,942	19,882	94.79	19,396	92.61
South	56,654	40,243	71.03	48,116	84.92
All SMSA's	27,966	15,432	55.18	21,655	77.43
1 million or more	8,731	5,285	60.53	6,711	76.86
Other SMSA's	19,235	10,147	52.75	14,944	77.69
Not SMSA	28,688	24,811	86.48	26,461	92.23
West	29,775	21,808	73.24	22,760	76.43
All SMSA's	21,619	14,206	65.71	15,193	70.27
1 million or more	12,441	7,251	58.28	9,141	73.47
Other SMSA's	9,178	6,955	75.77	6,052	65.94
Not SMSA	8,156	7,602	93.20	7,567	92.77

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.11. (original source: National Resource Evaluation Center, Office of Emergency Planning, Executive Office of the President)

[a]Holifield Attack - 1,466 megatons, at military plus 71 major population and industrial targets, with all weapons groundburst (maximum fallout)

[b]Spadefork Attack - 1,779 megatons, at primarily military targets, with slightly over half of weapons airburst

Daytime attack might have a somewhat different effect on the sex ratio from nighttime attack. In the daytime, a greater proportion of the male population is found in the downtown centers of cities than at night. Therefore, if a nuclear attack were to occur during the day and be directed at downtown areas of our large cities, it is likely that the ratio of men to women would be very slightly reduced. On the other hand, an opposite effect would take place if a nuclear attack with identical targets were to take place at night. This is because the metropolitan areas of the country contain a lower ratio of men to women than the non-metropolitan parts and because the fatality rate in the metropolitan part would be higher than in the non-metropolitan. For example, for the Holifield attack, it was calculated that daytime attack would reduce the ratio of males to females in the total population from .968 to .965 whereas a nighttime attack would increase it to .976.[16]

It is somewhat uncertain to what extent nuclear war would lead directly to other changes in the age composition of the United States. Under the assumption that within each small geographical area there is no tendency for any age group to have a higher fatality rate than any other age group, then nuclear attack, even though varying in its severity among these small geographical areas, would have a negligible effect on the nation's age structure. On the other hand, the evidence from natural disasters, such as hurricanes, and from air raids in World War II is that the elderly and, to a lesser extent, the very young, suffer a higher rate of fatalities than the remainder of the population. The deaths in these cases are caused by wind or blast damage.[17] Whether or not a similar picture of differential fatalities by age would emerge from a nuclear attack in

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[16] Ibid., p. 53.

[17] H.J. Friedsam, "Older Persons in Disaster," in George W. Baker and Dwight W. Chapman (eds.), Man and Society in Disaster (New York, Basic Books, 1962), pp. 151-182.

which fatalities result not only from blast damage but also from thermal effects and from radiation, can only be conjectured.[18]

We have now discussed the possible effects of nuclear attack on the age-sex composition of the population immediately following attack. However, we must now consider long-term changes in this composition during the post-attack period. In the long run, the age structure of the United States population would be affected not only by the age structure immediately following attack but also by the course of births and deaths in the period thereafter. In particular, it is plausible to believe that the birth rate would be substantially reduced in the immediate period following all-out attack, principally because of the large number of adults suffering from temporary sterility and the large number of persons recently widowed. Additional possible reasons provoking a decrease in the birth rate might be an economic collapse following attack and widespread feelings that it was cruel to bring children into the world. A deficit of births in the immediate post-attack period would distort the nation's age structure at least for the lifetime of those born during the period of birth deficit and to a lesser extent during the lifetime of their children.

It is also possible that the age-sex structure of the United States population in the period following attack would be affected by changes in the age pattern of mortality in the period following attack. In particular, we might expect in the post-attack period, as compared with the pre-attack period, a very much higher

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[18] The assumption that within each small geographical area, fatalities take place at random is a very useful assumption in studying the effects of attack on population composition. Making this assumption and utilizing knowledge concerning the impact of attack on each of the small geographical areas in the nation, one can estimate the post-attack composition of the nation in terms of such variables as educational attainment, occupation, race and ethnicity, fertility history, etc. To some extent, calculations concerning population composition based on this assumption will be biased if within given geographical areas, the elderly and the children do have a lower chance for survival. However, this fact would not affect population composition variables such as current occupation, which are classifications only of adults, very few of whom are elderly. Furthermore, differential vulnerability by age would not affect other variables which are not themselves correlated with age. Thus calculations concerning post-attack composition by race would not be affected by variations in vulnerability by age since age is not closely associated with race in the United States.

proportion of all deaths to be among infants and children. This is plausible if we assume that following nuclear attack the pattern of mortality in this country might revert to the patterns prevalent now in the underdeveloped nations. Life tables for underdeveloped nations show a much higher proportion of all deaths occurring to persons under 10 years of age than do life tables for developed nations.[19]

There are, therefore, three factors during the post-attack period which may create an indentation in the nation's age structure centering among the persons born in the years immediately preceding or following attack. The first of these is the probable reduction of births in the first few years immediately following attack. The second and third factors are the probable heightened fatality rates among young children during attack and in the immediate years following attack. If this indentation occurred, it would have three effects. The first effect chronologically would be distinctly positive--a lessening of the cost to the nation of supporting its child population. Expenditures on food, clothing and shelter for children could all be reduced. In addition, there would be a reduced load on our educational institutions beginning with elementary school and continuing on later to high school and college. Still later, the dent would have a second noticeable effect--a reduced number of entrants to the labor force. As in the United States in the 1950's when the small cohort born during the depression years reached working age, this reduction in the number of labor force entrants would probably bid up the wage and salary level of entrants but would create difficulties for employers looking for applicants to fill vacant positions. Finally, as the cohort born near the time of attack reached retirement, some 60 to 70 years following attack, its small size might considerably reduce the nation's expense for old age support.

If during and immediately after attack, the elderly suffer particularly high death rates, then there will also be a dent in the age structure among the very oldest age groups directly following attack. The immediate effect of this

[19] United Nations, "Methods for Population Projections by Sex and Age", Population Studies No. 25, (New York, 1956), pp. 70-81.

indentation would be favorable to the national burden of dependency. However, this benefit would be short-lived and would disappear perhaps ten years following attack, at which time death would have claimed almost all persons already elderly at the time of attack.

Marital and Family Characteristics

A possibly more serious effect of all-out nuclear war would be its effect on the marital and family status of the nation. Calculations concerning the effect on marital and family status of the two previously-mentioned hypothetical atomic attacks have also been made. Following the Holifield attack, up to 17 percent of all married persons might be widowed and up to 26 percent of all children might lose one or both parents (8 percent losing both parents and 9 percent each losing mother or father alone). Following the Spadefork attack, the proportions widowed and orphaned would be smaller but still of substantial magnitude.[20]

Since a nuclear attack under these assumptions would not markedly disturb the sex ratio, the restoration of a normal proportion of married persons would probably be fairly rapid. Possibly within a few years following attack, the great majority of persons losing their spouse during attack would have remarried, but the situation with respect to bereaved children would be more serious. Traditionally within our society the cost of raising children has been met very largely within the nuclear family However, after an atomic attack this mode of meeting child-rearing costs could no longer be so prevalent. Part of the financial responsibility for rearing the war orphans could be shifted to other members of their extended kin groups. The extent to which this would be possible is worthy of detailed study.[21] Probably, much of the enormous financial burden of

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[20] See David M. Heer, op. cit., pp. 55-65, for details of the results and of the methods used to estimate possible post-attack proportions of widowed married persons and orphans.

[21] It is at this point that a demographic portrait of post-attack society meshes with a different level of social analysis--the description of social structure and patterns of interaction among members of the population. The projected use of extended kinship groups as social locations for placing orphans implies

supporting widows and children would have to be met by the Federal government. State and local government would not be able to cope with the problem because of the very uneven incidence of the burden by area. Many of the orphaned children might have to be placed in institutions. On the other hand, others might be placed with relatives to whom the Federal government could grant special child-care payments. In addition, there would be need for the nationwide establishment of large numbers of day-care centers for children. These would be especially necessary for children losing their mother but not their father, yet they would also be necessary for children who had lost only their father and whose mother was working. Both the increased frequency of children in institutions and the greater prevalence of children receiving care in day centers would have the effect of removing from the family much of its traditional child-care function. A complete restoration with respect to the proportion of children living in traditional family circumstances could not be reached until some twenty years following attack--the time necessary for the youngest of the orphans to reach adulthood. Of course, however, the situation would show gradual improvement during this period as fully-orphaned children attained maturity or could be placed with relatives, and as men and women, who had been forced to place their children in the day-care centers, remarried and became able to give their children a more conventional family life.

However, it is possible that a full restoration of the pre-attack system of child-care would never be accomplished. Parents who had accustomed themselves to the use of public child-care facilities might wish to continue using them, and it is therefore quite likely that the proportion of children receiving attention

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(Footnote 21 continued) that it is possible to describe kinship networks and their variations in pattern for the whole population. In a recent study at Northwestern University, Greer and Winch present data which suggest that for some significant groups in the population, there are patterns of kinship and voluntary organization which could potentially provide the social bases for managing dislocated individuals following attack. Scott A. Greer and Robert F. Winch, Kinship and Voluntary Organization in Post-Thermonuclear Attack Society: Some Exploratory Studies (McLean, Va.: Human Sciences Research, Inc., 1965).

in day-care centers would never drop to the level of the pre-attack period. (In 1959 only 121,000 out of 5.1 million children under 12 years old whose mothers were working were in group care centers).[22]

Levels of Education, Training, and Occupational Skill

Recently considerable concern has been expressed that one aftermath of a nuclear war would be a sharp decline in the average educational attainment of the nation's adults and in their level of occupational skill. It is contended that the brunt of nuclear attack will be born by the metropolitan areas of the nation and that it is in these metropolitan areas that the bulk of the nation's most highly trained and skilled persons are to be found.[23] However, there is evidence that a very pessimistic view of this situation may exaggerate the difficulties involved. Let us consider first some previous calculations concerning the effect of the Holifield and Spadefork attacks. These are illustrated in Tables III-3 through III-12, pages 298 - 307. According to these calculations, the greatest change in educational and occupational composition would follow a daytime version of the Holifield attack. Subsequent to this attack, the proportion of college graduates among men and women 25 years old and over would decline only from 7.7 (Table III-3) to 7.3 per cent (Table III-6) and the proportion among adult males only from 9.7 (Table III-4) to 9.1 per cent (Table III-7). Furthermore, the proportion of professional, technical, and kindred workers (Census classification) among employed persons of both sexes would be reduced only from 11.2 per cent (Table III-8) to 10.9 per cent (Table III-11) and among men from 10.3 per cent (Table III-9) to 9.8 per cent (Table III-12). Changes following a nighttime version

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[22] Henry C. Lajewski, Child Care Arrangements of Full-Time Working Mothers (Washington: U.S. Children's Bureau, 1959), p. 15.

[23] Robert A. Dentler and Phillips Cutright, Hostage America (Boston: Beacon Press, 1963), pp. 15-17. The attack labeled the "Holifield Attack" in the present essay received special attention from Dentler and Cutright, who sought to reexamine its possible effects. See ibid., Chapter 1.

Table III-3

YEARS OF SCHOOL COMPLETED BY BOTH SEXES OF THE POPULATION
25 YEARS OLD AND OVER, BY REGION OF RESIDENCE
(Numbers in thousands)

	Preattack Population				
		Regions			
	United States	North-east	North-central	South	West
Total of both sexes 25 years old and over					
Number	99,280	26,424	28,705	28,813	15,338
Percentage Distribution: Total	100.0	100.0	100.0	100.0	100.0
No school years completed	2.2	2.7	1.2	3.0	2.0
Elementary, 1 to 4 years	5.9	4.0	4.2	10.6	3.6
Elementary, 5 or 6 years	7.4	1.7	6.0	10.9	4.8
Elementary, 7 years	6.4	6.0	5.9	8.4	4.0
Elementary, 8 years	17.4	19.1	21.6	13.1	14.6
High School, 1 or 2 years	14.1	15.2	14.3	13.1	13.9
High School, 3 years	5.5	5.5	5.1	5.6	5.9
High School, 4 years	24.6	24.9	26.2	20.4	2[illegible].9
College, 1 to 3 years	8.9	7.8	8.7	7.9	12.9
College, 4 years	4.7	4.9	4.3	4.4	5.3
College, 5 years or more	3.0	3.2	2.7	2.6	3.8

Source: After Nuclear Attack: A Demographic Inquiry, Table 1.30.

Table III-4

YEARS OF SCHOOL COMPLETED BY MALES OF THE POPULATION
25 YEARS OLD AND OVER, BY REGION OF RESIDENCE
(Numbers in thousands)

	Preattack Population				
		Regions			
	United States	North-east	North-central	South	West
Total males 25 years old and over					
Number	47,827	12,645	13,877	13,758	7,547
Percentage Distribution: Total	100.0	100.0	100.0	100.0	100.0
No school years completed	2.3	2.5	1.3	3.3	2.2
Elementary, 1 to 4 years	6.9	4.5	4.8	12.8	4.3
Elementary, 5 or 6 years	7.8	7.1	6.5	11.0	5.2
Elementary, 7 years	6.8	6.3	6.9	8.5	4.4
Elementary, 8 years	17.6	19.1	22.0	12.9	15.3
High School, 1 or 2 years	13.5	14.9	13.8	12.3	13.1
High School, 3 years	5.5	5.8	5.2	5.3	6.2
High School, 4 years	21.2	20.7	22.7	17.6	25.5
College, 1 to 3 years	8.7	8.1	8.0	7.8	12.5
College, 4 years	5.3	6.1	4.8	4.8	6.0
College, 5 years or more	4.4	4.9	3.9	3.8	5.4

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.30.

Table III-5

YEARS OF SCHOOL COMPLETED BY MALES OF THE POPULATION 25 YEARS OLD AND OVER, BY URBAN LOCATION IN DAYTIME AND NIGHTTIME
(Numbers in thousands)

	Preattack Population Regions					
	United States - Nighttime			United States - Daytime		
	Central cities	Ring	Not in SMSA	Central cities	Ring	Not in SMSA
Total males 25 years old and over						
Number	15,944	14,556	17,327	19,334	11,671	16,772
Percentage Distribution: Total	100.0	100.0	100.0	100.0	100.0	100.0
No school years completed	2.7	1.5	2.7	2.2	2.0	2.8
Elementary, 1 to 4 years	6.2	4.3	9.9	5.2	5.2	10.1
Elementary, 5 or 6 years	7.8	5.9	9.3	6.9	6.8	9.4
Elementary, 7 years	6.1	5.6	8.4	5.6	6.2	8.5
Elementary, 8 years	16.7	15.5	20.2	15.7	17.2	20.0
High School, 1 or 2 years	14.3	14.2	12.3	14.1	14.5	12.1
High School, 3 years	5.9	6.1	4.8	6.1	5.8	4.7
High School, 4 years	20.5	23.8	19.5	21.8	22.6	19.5
College, 1 to 3 years	9.7	10.4	6.2	10.5	9.2	6.2
College, 4 years	5.4	7.2	3.7	6.5	5.7	3.7
College, 5 years or more	4.8	5.6	3.0	5.3	4.8	3.0

Source: Heer, After Nuclear Attack: A Demographic Inquiry
Table 1.30.

Table III-6

YEARS OF SCHOOL COMPLETED BY BOTH SEXES OF THE POPULATION 25 YEARS OLD AND OVER, AMONG THE PROJECTED SURVIVORS OF TWO HYPOTHETICAL ATTACKS
(Numbers in thousands)

	Survivors of Holifield Attack[a]		Survivors of Spadefork Attack[b]	
	United States		United States	
	Night	Day	Night	Day
Total of both sexes 25 years old and over				
Number	69,054	67,708	80,893	81,135
Percentage Distribution: Total	100.0	100.0	100.0	100.0
No school years completed	2.1	2.1	2.2	2.2
Elementary, 1 to 4 years	6.1	6.2	6.1	6.1
Elementary, 5 or 6 years	7.4	7.5	7.5	7.5
Elementary, 7 years	6.5	6.5	6.5	6.5
Elementary, 8 years	17.7	17.8	17.5	17.6
High School, 1 or 2 years	13.9	13.9	14.0	14.0
High School, 3 years	55.4	5.3	5.4	55.4
High School, 4 years	24.7	24.6	24.5	24.5
College, 1 to 3 years	8.8	8.7	8.7	8.7
College, 4 years	4.6	4.5	4.6	4.6
College, 5 years or more	2.9	2.8	2.9	2.9

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.30.

[a] Holifield Attack - 1,466 megatons, at military plus 71 major population and industrial targets, with all weapons groundburst (maximum fallout)

[b] Spadefork Attack - 1,779 megatons, at primarily military targets, with slightly over half of weapons airburst.

Table III-7

YEARS OF SCHOOL COMPLETED BY MALES OF THE POPULATION 25 YEARS OLD AND OVER, AMONG THE PROJECTED SURVIVORS OF TWO HYPOTHETICAL ATTACKS
(Numbers in thousands)

	Survivors of Holifield Attack[a]		Survivors of Spadefork Attack[b]	
	United States		United States	
	Night	Day	Night	Day
Total of males 25 years old and over				
Number	33,402	32,380	39,024	38,450
Percentage Distribution: Total	100.0	100.0	100.0	100.0
No school years completed	2.3	2.3	2.3	2.4
Elementary, 1 to 4 years	7.2	7.4	7.1	7.2
Elementary, 5 or 6 years	7.8	7.9	7.8	7.9
Elementary, 7 years	7.0	7.1	6.9	7.0
Elementary, 8 years	18.0	18.2	17.7	17.8
High School, 1 or 2 years	13.3	13.3	13.4	13.4
High School, 3 years	5.4	5.4	5.5	5.5
High School, 4 years	21.3	21.1	21.1	21.0
College, 1 to 3 years	8.4	8.2	8.5	8.4
College, 4 years	5.2	5.0	5.3	5.2
College, 5 years	4.2	4.1	4.3	4.2

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.30.

[a]Holifield Attack - 1,466 megatons, at military plus 71 major population and industrial targets, with all weapons groundburst (maximum fallout)

[b]Spadefork Attack - 1,779 megatons, at primarily military targets, with slightly over half of weapons airburst

Table III-8

MAJOR OCCUPATION GROUP OF EMPLOYED PERSONS OF BOTH SEXES, BY REGION OF RESIDENCE
(Numbers in thousands)

	Preattack Population				
		Regions			
		Northeast	North-central	South	West
Total of both sexes employed					
Number	64,442	16,987	18,866	18,417	10,172
Percentage Distribution: Total	100.0	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers	11.2	12.0	10.6	10.0	13.0
Farmers and farm managers	8.8	0.9	6.1	5.0	2.6
Managers, officials, and proprietors, except farm	8.4	8.2	8.1	8.4	9.5
Clerical and kindred workers	14.6	16.7	14.2	12.6	15.5
Sales workers	7.1	7.2	7.3	6.6	7.2
Craftsmen, foremen, and kindred workers	13.4	13.4	13.9	12.3	14.6
Operatives and kindred workers	18.4	21.0	18.4	18.2	14.6
Private household workers	2.6	1.9	2.0	4.3	2.0
Service workers, except private household	8.5	8.3	8.4	8.5	8.9
Farm laborers and foremen	2.2	0.7	1.9	3.4	3.0
Laborers, except farm and mine	4.8	4.1	4.3	5.9	4.8
Occupation not reported	5.0	5.6	4.9	4.9	4.2

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.33.

Table III-9

MAJOR OCCUPATION GROUP OF EMPLOYED MALES, BY REGION OF RESIDENCE
(Numbers in thousands)

	Preattack Population				
		Regions			
	United States	North-east	North-central	South	West
Total males employed					
Number	43,396	11,308	12,946	12,260	6,882
Percentage Distribution: Total	100.0	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers	10.3	11.9	9.6	8.8	12.0
Farmers and farm managers	5.4	1.2	8.5	7.0	3.7
Managers, officials, and proprietors, except farm	10.7	10.9	10.0	10.8	11.5
Clerical and kindred workers	7.2	8.8	7.1	6.2	6.6
Sales workers	6.9	7.5	6.7	6.4	7.0
Craftsmen, foremen, and kindred workers	19.3	19.4	19.6	18.0	21.1
Operatives and kindred workers	19.9	21.1	20.6	19.8	16.7
Private household workers	0.1	0.1	0.1	0.2	0.1
Service workers, except private household	6.0	6.9	5.2	5.8	6.5
Farm laborers and foremen	2.7	1.0	2.2	4.1	4.0
Laborers, except farm and mine	6.8	6.0	6.0	8.5	6.9
Occupation not reported	4.7	5.4	4.4	4.6	4.0

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.33.

Table III-10

MAJOR OCCUPATION GROUP OF EMPLOYED MALES,
BY URBAN LOCATION IN DAYTIME AND NIGHTTIME
(Numbers in thousands)

	Preattack Population United States - Nighttime			Preattack Population United States - Daytime		
	Central cities	Ring	Not in SMSA	Central cities	Ring	Not in SMSA
Total males employed						
Number	14,395	13,656	15,345	18,154	10,557	14,685
Percentage Distribution: Total	100.0	100.0	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers	11.1	13.0	7.3	12.0	11.6	7.3
Farmers and farm managers	0.2	1.9	13.4	0.1	2.6	14.0
Managers, officials and proprietors, except farm	10.8	11.7	9.7	11.9	9.7	9.9
Clerical and kindred workers	9.6	7.6	4.5	9.9	6.4	4.3
Sales workers	7.7	7.9	5.2	8.4	6.2	5.5
Craftsmen, foremen, and kindred workers	18.5	22.1	17.7	19.1	22.6	17.3
Operatives and kindred workers	20.3	19.1	20.2	19.4	21.0	19.6
Private household workers	0.1	0.1	0.1	0.1	0.1	0.2
Service workers, except private household	8.2	5.1	4.7	7.1	5.8	4.7
Farm laborers and foremen	0.2	1.5	6.1	0.2	2.0	6.3
Laborers, except farm and mine	6.9	5.9	7.6	6.2	7.2	7.4
Occupation not reported	6.5	4.1	3.5	5.6	4.7	3.5

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.33

Table III-11

MAJOR OCCUPATION GROUP OF EMPLOYED PERSONS OF BOTH SEXES, AMONG THE PROJECTED SURVIVORS OF TWO HYPOTHETICAL ATTACKS
(Numbers in thousands)

	Survivors of Holifield Attack[a]		Survivors of Spadefork Attack[b]	
	United States		United States	
	Night	Day	Night	Day
Total of both sexes employed				
Number	44,497	42,959	52,289	51,418
Percentage Distribution: Total	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers	11.0	10.9	11.1	11.0
Farmers and farm managers	4.9	5.1	4.3	4.4
Managers, officials, and proprietors, except farm	8.4	8.3	8.4	8.4
Clerical and kindred workers	13.6	13.3	14.2	14.0
Sales workers	7.0	6.9	7.0	7.0
Craftsmen, foremen, and kindred workers	13.6	13.5	13.5	13.4
Operatives and kindred workers	18.4	18.4	18.5	18.5
Private household workers	2.6	2.7	2.6	2.7
Service workers, except private household	8.3	8.4	8.4	8.4
Farm laborers and foremen	2.7	2.8	2.4	2.5
Laborers, except farm and mine	4.9	4.9	4.8	4.8
Occupation not reported	4.6	4.7	4.8	4.9

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.33.

[a]Holifield Attack - 1,466 megatons, at military plus 71 major population and industrial targets, with all weapons groundburst (maximum fallout)

[b]Spadefork Attack - 1,779 megatons, at primarily military targets, with slightly over half of weapons airburst

Table III-12

MAJOR OCCUPATION GROUP OF EMPLOYED MALES, AMONG THE PROJECTED SURVIVORS OF TWO HYPOTHETICAL ATTACKS
(Numbers in thousands)

	Survivors of Holifield Attack[a]		Survivors of Spadefork Attack[b]	
	United States		United States	
	Night	Day	Night	Day
Total males employed				
Number	30,316	29,194	35,390	34,757
Percentage Distribution: Total	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers	10.0	9.8	10.1	10.1
Farmers and farm managers	6.9	7.2	6.0	6.2
Managers, officials, and proprietors, except farm	10.6	10.4	10.6	10.6
Clerical and kindred workers	6.6	6.4	6.9	6.9
Sales workers	6.6	6.5	6.7	6.7
Craftsmen, foremen, and kindred workers	19.4	19.3	19.3	19.2
Operatives and kindred workers	19.8	19.9	19.9	19.9
Private household workers	0.1	0.1	0.1	0.1
Service workers, except private household	5.5	5.6	5.8	5.9
Farm laborers and foremen	3.3	3.4	3.0	3.0
Laborers, except farm and mine	6.9	7.0	6.9	6.9
Occupation not reported	4.3	4.4	4.5	4.6

Source: Heer, After Nuclear Attack: A Demographic Inquiry, Table 1.33.

[a]Holifield Attack - 1,466 megatons, at military plus 71 major population and industrial targets, with all weapons groundburst (maximum fallout)

[b]Spadefork Attack - 1,779 megatons, at primarily military targets, with slightly over half of weapons airburst

of the Holifield attack or either day or night versions of the Spadefork attack would be less pronounced, with the least change occurring after the nighttime Spadefork attack. Following that attack, the proportion of college graduates among adults of both sexes would be reduced by only two-tenths of one per cent and among males by only one-tenth of one per cent. Similarly, the proportion of professionals among the employed of both sexes would be reduced by only one-tenth of one per cent and among males by two-tenths of one per cent.[24]

On the other hand, it is obvious that the picture presented above is too optimistic for several reasons. The first relates to the size of the attacks chosen for analysis. Both the Holifield and Spadefork attacks are relatively light. For example, the number of fatalities caused by the Holifield attack (55 million) is considerably less than the probable number which would occur if an attack were to take place currently. The author has previously shown that whenever the thrust of attack is directed at metropolitan areas, changes in population composition will be directly proportional to the size of the attack.[25] Therefore, an attack occurring today would probably produce greater changes in educational and occupational composition than those calculated for the Holifield and Spadefork attacks. The author has also shown that there is a probable limit to the amount of change in population composition that the very largest attack could bring. This limit is simply the composition of the population of the United States living outside of metropolitan areas.[26] It is assumed that the very heaviest attacks might kill everybody in the metropolitan areas and that all survivors would be in non-metropolitan areas. In that event, it is highly likely that the surviving population would have the same population composition as the pre-attack non-metropolitan population. Since data are readily available for the educational and occupational

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[24] David M. Heer, op. cit., pp. 174-195 and 206-232.

[25] Ibid., pp. 27-34.

[26] Ibid., pp. 33-34.

composition of the non-metropolitan population of the United States, this maximum decline can be easily calculated. For both sexes the proportion of college graduates might decline from 7.7 percent to a minimum of 5.7 percent and for males from 9.7 to 6.7 percent. The proportion of professionals among employed persons of both sexes might decline at maximum from 11.2 to 9.3 percent and among employed men from 10.3 to 7.3 percent.[27]

Secondly, it must be admitted that the loss in personnel among the very skilled will be greater than the loss among the skilled population as a whole. For example, physicians tend to be spread fairly evenly over the whole country with only a moderate concentration in urban and metropolitan areas. Nevertheless, the most skilled specialists and the most renowned research workers are most likely to be located in the largest metropolitan areas. Therefore, nuclear attack will cause greater fatalities among the best members of the medical profession than among the average members. The same will hold for other professionals and for businessmen as well. Thus, even an attack on New York City alone might have a very important effect on the number of top-flight professional and business leaders surviving attack.

A third difficulty arises from the fact that the loss in skilled manpower may not be confined to that occurring at the moment of attack. To the extent that our educational system cannot be restored following attack, young persons growing up in its aftermath will not receive the quality and quantity of education they would otherwise have received. The immediate restoration of our educational system will be difficult for two reasons. First, funds for educational restoration will have to compete with demands for capital for many other worthy goals, such as the reconstruction of industry, agriculture, housing, etc. Second, there will be the important dilemma of whether adolescent students should spend time in school or enter the labor force directly so that they may make an immediate contribution to production and help the nation rebuild its damaged economy.

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[27] Ibid., pp. 175-76, 178-79, 207-08, and 210-211.

It is, in fact, conceivable that the loss in education and skills resulting from post-attack events may be greater than the loss in skills resulting directly from attack.

Restoration of losses in educational level would, of course, take a lengthy time period. Persons five years old at the time of attack and receiving a markedly inferior education in the post-attack aftermath would still be in the labor force 55 years later. Thus age cohorts with highly diverse levels of educational attainment would coexist for a long period of time. However, the period of time required for restoration of the nation's skill level could be decreased if adult education facilities were later made available to persons suffering disruption of their regular education in the immediate post-attack period.

Incidence of Sick and Disabled

A final change in population composition which a nuclear attack might induce would be in the prevalence of sick and disabled persons. Nuclear attack would no doubt cause many persons to go blind, to lose one or more limbs, to be severely burned, or to suffer at least temporarily from radiation sickness. To the extent that rehabilitation would be possible, improvements could be made before the generation of disabled had completed its life span. On the other hand, the hard core of persons who could not be rehabilitated would remain within the population for as long as 80 years following attack. Further research to estimate the total man-years which might be lost due to disabilities would be of great value to civil defense planning.

Recovery of Appropriate Composition: Summary

We may now summarize this discussion of the recovery of appropriate population composition following all-out attack. First, as a result of attack, we can expect some changes in age composition. These may be caused directly by attack, or by changes in age-specific mortality following attack, or by a reduction in the number of births immediately following attack. These changes in age composition will have various consequences, both beneficial and adverse, over a

period of time lasting up to 80 years. Second, during the first few years immediately following an all-out attack, we may expect a sharp reduction in the proportion of persons currently married and for a period up to twenty years following attack a sharp increase in the proportion of orphaned children, many of whom will require care in an extra-family setting. Third, there will be a decline in the nation's educational and occupational skill level, caused directly by attack and by the strong possibility that educational facilities could not be restored to the pre-attack level until several years thereafter. This decline in skill level might endure for at least 55 years. Finally, there will be an increase in the proportion of disabled persons, continuing up to 80 years following attack.

III. The Rate of Population Growth

The rate of population growth is equal to the algebraic difference between the birth rate and the death rate plus the algebraic difference between the rates for immigration and emigration. In the absence of migration, the rate of population growth is simply the algebraic difference between birth rate and death rate. Currently, neither immigration nor emigration is an important component of United States population growth. We shall presume that these two components of population growth would remain relatively unimportant during the post-attack period and therefore confine our discussion in this section of the essay to birth and death rates. We shall consider first the changes in these rates which might be occasioned by nuclear attack, second, the definition of appropriate birth and death rates for the post-attack period, and third, the time period necessary for recovery of these rates to appropriate levels.

Birth Rate

Let us consider first the impact of nuclear attack on the American birth rate. Currently, the birth rate in the United States (and also more refined measures of fertility) is substantially higher than it was a generation previous and also considerably higher than in the countries of Western Europe. However, the

American level of fertility falls far short of the physiologically possible maximum, and is substantially exceeded by that in many Latin American, Asian, and African nations.[28]

A nuclear attack would have certain immediate effects on women pregnant at the time of attack. From observations carried out following the atomic bombings of Hiroshima and Nagasaki, we know that women exposed to large amounts of radiation have a substantially higher probability of miscarriage and stillbirth than women in normal circumstances. However, the available evidence is too fragmentary to assert quantitatively how much adverse effect each added exposure to radiation produces.[29]

Secondly, the radiation accompanying a nuclear attack would increase the incidence of sterility among both men and women. Again, we do not have sufficient evidence from existing data to state quantitatively just how much damage would result. However, few persons would be made permanently sterile by radiation. Radiation doses sufficiently large to instill permanent sterility will also prove fatal for most persons. Nevertheless, as one consequence of nuclear attack, many persons would suffer temporary sterility.[30] Because of the prevalence of this temporary sterility, the number of births would be decreased by some unknown degree from a period beginning nine months after attack and extending one or two years thereafter. The larger the attack and the greater the amount of radioactivity, probably the larger will be the proportion of the total population temporarily sterilized.

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[28] In 1962, the birth rate in the United States was 22.4 per thousand population. Among the countries having lower birth rates were the United Kingdom (17.8 per thousand in 1961), France (17.9 per thousand in 1962), Sweden (14.2 per thousand in 1962) and Hungary (12.9 per thousand in 1962). Among the many countries with fertility higher than that in the United States were Guatemala (49.9 births per thousand population in 1961), Egypt (44.0 births per thousand in 1961), and Ceylon (36.6 per thousand in 1960).

[29] David M. Heer, op. cit., pp. 317-318.

[30] National Academy of Sciences - National Research Council, Long-Term Effects of Ionizing Radiations from External Sources (Washington: National Academy of Sciences-National Research Council, 1961), pp. 23-24.

Third, fertility in the immediate post-attack period would be reduced by the greately increased incidence of widowhood among persons of reproductive age. As widowed survivors of the attack remarried, the number of births would have an opportunity to increase but it is reasonable to expect that not all of those widowed by the attack would have remarried until perhaps five years or more following attack. Again, the larger the attack, the higher the proportion who would be widowed and the greater would be the reduction in the birth rate.

Fourth, as we mentioned earlier, the willingness of couples to bear children might be reduced if, following attack, the economy should collapse or the future looked so bleak that couples developed the belief that it would be cruel to bring children into the world.

In summary it appears likely that the birth rate in the United States for perhaps the first five years following an all-out nuclear attack would be substantially lower than in the period immediately prior to attack. On the other hand, it is quite possible that the prewar level could be restored at the end of this initial five-year period. In fact, several factors would be conducive to a rise in the level of fertility. First, women surviving the attack would be those whose fertility in the pre-attack period was somewhat higher than that of those in the total pre-attack population. Second, there might be a dearth of contraceptive devices due to lack of means for their production or distribution. Third, some couples who, if attack had not occurred, would have wanted no more children might now want additional children as a replacement for those killed during the attack.

Death Rate

What can we say about the death rate in the United States following a nuclear attack? Unfortunately, assumptions concerning mortality subsequent to nuclear attack are hinged with great uncertainty. We do not know to what extent great disease epidemics would sweep the nation. Nor do we have exact data on the amount of life-shortening and other long-range effects induced by radiation. However, one generalization is fairly certain. This is that the level of mortality among initial survivors of an attack will be a function of the size of attack. As

Allen Barton has pointed out, the amount of help which can be given the disaster area by the segment of the society which has not experienced a disaster depends on the total size of the disaster.[31] The less help that can be brought in from the outside, the higher the death rate will be among the initial survivors.

In the popular imagination one of the most severe long-term consequences of nuclear attack would be a sharp increase in mortality from radioactivity. However, the popular view may again be exaggerated. Some light on the impact of radiation on mortality from all causes is obtained by a study conducted by the Atomic Bomb Casualty Commission among the survivors of the Hiroshima and Nagasaki attacks.[32] Data were obtained concerning deaths and death rates in these cities during the period 1950-58. The study was concluded with these cautious words:

> The present data, therefore, offer no substantial support for the hypothesis that radiation exerts a considerable influence on mortality from all causes in man. The present samples are, of course, small. Moreover, the particular segment of time (1950-58) may be too early to allow the expression of conditions with long latent periods following exposure. Hence if the present data do not confirm a general mortality effect of radiation in man, neither do they refute it.

From these results I have come to the conclusion that even if radiation does have a general effect on mortality, its effect will be overshadowed by other more important effects. It therefore becomes important to consider the level of mortality immediately after the end of World War II among those European nations which suffered the heaviest losses in population and capital during the war. As an example, let us consider death rates in East Germany. Very early in World War II, 1940, the death rate of all of Germany was 12.7 per thousand population. In 1946,

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[31] Allen A. Barton, Social Organization Under Stress: A Sociological Review of Disaster Studies (Washington: National Academy of Sciences - National Research Council, 1963), pp. 185-192.

[32] Gilbert W. Beebe, et al., Life Span Study, Report Number 1 (Hiroshima: Atomic Bomb Casualty Commission, undated).

the year following the end of World War II, the official death rate had risen to 22.9 per thousand and by 1947 was only slightly lower (19.0 per thousand). By 1960 the death rate had declined to approximately its prewar level and was 13.3 per thousand. The death rate in the USSR immediately after World War II was probably even higher than in East Germany. Although no figure is available for 1946, an estimate for 1947, computed by the U.S. Bureau of the Census on the basis of various statements by Soviet officials, is 22.0 per thousand.[33]

During World War II, the war-induced fatalities in the USSR were approximately 10 percent of the prewar population,[34] and 6 percent of the total population in Germany.[35] Each of these percentages of war-induced fatalities is much less than that anticipated for the United States as a result of either the Holifield or Spadefork attacks, and far less than the 69 percent fatality figure envisioned as possible in 1970 in the absence of civil defense preparations. Thus to assume that the death rate in the United States after an all-out nuclear attack would be at least as high as that in postwar USSR or East Germany seems a very conservative assumption. Even such a death rate, of perhaps 23 per thousand for the stationary population, would be more than one and one-half times the present stationary death rate in the United States.[36]

However, if the death rate in post-attack United States were to follow the international pattern following World War II, it would not long remain at its high initial level. For example, following the post-World War II pattern, a death rate

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[33] Arthur A. Campbell, "A Method of Projecting Mortality Rates Based on Postwar International Experience," in International Population Reports, Series P-91, No. 5 (Washington: U.S. Bureau of the Census, 1958), p. 27.

[34] David M. Heer, op. cit., p. 313.

[35] Karl Schwarz, "Deutsche Bevölkerungsbilanz des 2. Weltkrieges," in Wirtschaft und Statistik, VIII, 10 (October, 1956), p. 494.

[36] The death rate for the stationary population is the death rate which would obtain in a population if the age structure of that population was identical to that of the life table pertaining to that population's age-specific mortality schedule.

of 23 per thousand for the stationary population would be reduced to 17 per thousand after ten years and to 15 per thousand after twenty years.[37] However, even with such rapid deceleration, a period of twenty years would be not quite sufficient to restore the American death rate to its pre-attack level, which in 1962 was 14.3 per thousand for the stationary population.

Problems in the Recovery of Appropriate Birth and Death Rates

We have now discussed what might be the consequences of all-out nuclear attack for birth and death rates in the United States. We have yet to discuss what we mean by the recovery of an appropriate set of birth and death rates and an appropriate rate of population growth or how long it would take to achieve such recovery. It is obvious that if we aim at a given rate of population growth, this rate can be achieved by increasing the birth rate even if the death rate remains inordinately high and cannot be reduced. On the other hand, there is most probably a consensus that the most satisfactory way of achieving a given rate of population growth would attempt to minimize the death rate and strive for a birth rate just sufficiently high to assure the desired rate of population growth.

Let us begin then, by considering what we might mean by a restoration of an appropriate level of mortality. One definition of restoration might be the recovery of the death rate existing in the United States immediately prior to attack. As we have seen, if the experience of nations after World War II is a guide, then even the pre-attack death rate could not quite be achieved within twenty years following attack. A better definition of recuperation in the death rate would be the attainment of that death rate which would exist if attack did not take place. This last rate will be lower than the pre-attack death rate to the extent that within the foreseeable future medical science is able to eliminate certain current causes of death. To attain a death rate comparable to that occurring without attack would, of course, take considerably longer than merely to restore the level existing prior to attack.

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[37] David M. Heer, op. cit., p. 316.

The restoration of an appropriate birth rate would be achieved when the birth rate had attained a level sufficient to obtain the desired rate of population growth given existing mortality. As we have mentioned previously, restoration of the pre-attack birth rate might well take place within five years following attack. However, one might argue that the pre-attack fertility level might not be sufficient in the post-attack situation. Because a greatly reduced population might present a danger to America's international status, the nation might consider it imperative to increase its population at a fairly substantial rate. Given the possibility that the death rate might still be abnormally high, this population increase would only be possible through raising the birth rate substantially above its pre-attack level. Such an increase in the birth rate might be accomplished by government-sponsored incentives for large families. In order to attain as rapidly as possible a population equal to that of the pre-attack period, such artificial stimulation of the birth rate might have to continue over quite an extended period--certainly at least a generation. On the other hand, the costs of such a policy of subsidized fertility increase would also have to be recognized. The costs would include not only the direct cost of the family allowance payments but the personal expenditures of parents in raising the additional children, the cost of additional educational facilities, and the costs of having adult women spend a greater proportion of their time in child-rearing and less time in gainful employment outside the home. Meeting these costs would militate against expending funds on restoration of capital equipment and thereby delay the rise in gross national product. Consequently, although the nation might gain its population increase, it is not certain whether or not its power in international affairs would increase correspondingly. Thus a high or even moderate rate of population growth might not prove to be advisable in the post-attack situation, and an appropriate birth rate might soon be achieved with little conscious effort directed to fertility increase.

IV. Summary

In this paper we have attempted to discuss the possible effects of nuclear attack on the size, composition, and growth rate of the United States population.

We have tried to indicate some of the social and economic consequences of these demographic changes, to clarify what further changes would be necessary to achieve demographic recuperation, and to delineate the length of time which might be necessary for demographic recuperation under varying circumstances.

In our discussion of population size we emphasized that in the absence of civil defense preparations an all-out nuclear attack occurring around 1970 might kill approximately 69 per cent of the total population. One reason why the nation would be so vulnerable to nuclear attack is the high concentration of our population in urbanized areas, which comprise less than one per cent of the nation's land area but contain over 53 per cent of the nation's population. A drastic decline in the nation's population might have important social and economic consequences. The consequence of such a population reduction for the nation's standard of living would depend heavily on the amount of capital and natural resources also destroyed during attack. A fallout shelter program preserving additional lives but not additional resources would complicate the problem of making a living in the post-attack environment. A sharp reduction in population size would also affect the economies and diseconomies inherent in alterations of the scale of production. A smaller scale of production might present both economic disadvantages and advantages.

A very large reduction in the size of the United States population might also, by drastically curtailing the number of scientists, adversely affect scientific output in the nation and, hence, its ability to make technological advances.

Furthermore, a much smaller population might, under certain circumstances, reduce the power of the United States in international affairs. Here perhaps the most important conditioning factor would be the degree of population loss sustained by other world powers. The greater United States population loss compared with that of other major nations, the greater the probable loss of United States power in international affairs.

A rather lengthy time period would be necessary in order for the United States population to recover to its pre-attack level. For example, under certain realistic assumptions, restoration of the pre-attack population following an attack

reducing the population to half its former level might take around 56 years. An even longer period of time would be necessary to enable a restoration of United States population relative to that of nations escaping attack.

The aftermath of nuclear attack would also entail some changes in the composition of the United States population. Change in the sex composition of the population following a nuclear attack would probably be much less than that following conventional wars, in which members of the military have suffered a high number of fatalities compared to losses among civilians.[38] It is possible that immediately following nuclear attack, the composition of the United States population by age would remain essentially unchanged. On the other hand, there is some evidence leading to the conclusion that the elderly and, to a lesser extent, the very young might suffer higher fatality rates from nuclear attack than adults of economically productive age. Moreover, other changes following attack might create further changes in the nation's age structure. In particular, a decline in the birth rate in the first few years following attack and changing patterns of age-specific mortality might cause a sharper reduction in the number of persons who had been born just before or after attack than in other birth cohorts. Such a reduction in the number of persons who had been born near the time of attack would have the immediate effect of reducing the ratio of dependents to wage-earners and hence enable the nation in the immediate post-attack period to have a higher standard of living than would otherwise be possible. On the other hand, it would tend to create a labor shortage some twenty years after attack, when a relatively small cohort would enter the labor market. Another possibility for the immediate post-attack period--a reduction in the proportion of aged persons--would also temporarily reduce the nation's burden of dependency.

Nuclear attack would create large changes in the marital and family status of the surviving population. According to calculations made with reference to the relatively small Holifield attack, up to 17 per cent of all married persons

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[38] This assumes that the principal losses of the nuclear war result from early-phase massive nuclear exchange and not from related or subsequent conventional military engagements.

mi, it be widowed and up to 26 per cent of all children might lose one or both pa nts. Such drastic disruptions of family ties, particularly those for children, mi it endure for relatively long periods and necessitate a major shift in the locus for he performance of child-care functions--away from the nuclear family to mo e impersonal arrangements subsidized by government.

The extent to which nuclear attack would directly change educational and oc pational composition of the nation's population has probably been exaggerated in ertain previous writing. It is doubtful that nuclear attack could reduce media educational attainment or occupational level below the not insubstantial level now obtaining among inhabitants of non-metropolitan areas. However, whereas att k might not reduce substantially the ratios of all professionals or of all col ge graduates to the total population, the ratio of outstanding professionals and business leaders to total population might be greatly decreased. Furthermo e, it is likely that a disruption of our educational system in the immediate post-attack years could cause a very large segment of our population to grow to adu thood without an adequate education. This last indirect effect might be gre ter than the direct effect of attack itself. A loss in educational attainment for he group born near the time of attack might retain its mark on the quality of the nation's labor force as late as 55 years following attack.

A final important consequence of nuclear attack for the composition of the United States population would be an increase in the proportion of the permanently disabled, an effect lasting up to 80 years following attack.

Nuclear attack would also have an important effect on the nation's rate of population growth during the post-attack period. If past experience concerning the aftermath of war is a valid guide, the death rate in the United States in the immediate post-attack period would be very much higher than it had been before attack. One estimate is that it would take somewhat more than twenty years for the pre-attack death rate to be restored. Nuclear attack would also affect, at least temporarily, the nation's birth rate. A reduction in the birth rate of perhaps five year's duration would result from the temporary sterilization of many adults and the increase in the proportion of widowed persons.

As a result of the increase in death rate and the decreased rate of births, the growth rate for the post-attack population might be nil for some time following attack and for a longer period might be lower than before attack. There would probably be a consensus that all possible efforts should be made to reduce the death rate as rapidly as possible during the post-attack period. Even assuming maximum efforts to reduce the death rate, it might be argued that the birth rate should be financially subsidized to achieve the high rate of population growth necessary to restore the United States population to its pre-attack size as rapidly as possible and thereby improve the standing of the United States in world affairs. On the other hand, the higher the birth rate during the post-attack period, the higher would be the costs of child-care to the nation. Meeting these costs could detract from the effort to restore other components of the nation's power. Thus, without corresponding compensatory policies or measures, a governmental attempt to encourage high fertility might possibly defeat the increase in national power it was designed to achieve.

Introduction to Chapter IV

In contrast to the longer term required for the restoration of post-attack population characteristics, the processes of restoring the post-attack economy will be dependent on a series of shorter term solutions to urgent problems in using surviving organizational and technological resources. Sidney G. Winter, Jr. takes as his task in Chapter IV "the assessment of the impact of nuclear war on the economic activity of the nation, the determination of conditions under which a meaningful degree of economic recovery might occur, and the development of policies which would enhance the prospects for such recovery". As a result, Winter's essay is marked not only by a detailed attention to the actual characteristics of the post-attack economy and its resources under a range of possible attack conditions; the essay also shows in unusual detail how policy problems directly derive from these characteristics and their configurations.

Preparatory to describing the basic characteristics of the post-attack economy, Winter indicates that there will be three sources of inherent ambiguities in the concept of recovery which guides post-attack operations. "First, there is a lack of unanimity in the society at present as to the proper uses of the nation's resources and the most appropriate form of economic organization". Second, general, systematic, fundamental shifts of basic values could occur, in the post-attack population as contrasted with the pre-attack population. Third, there is likely to be a lack of unanimity concerning social goals and ultimate definitions of recovery in the post-attack society.

With these sources of ambiguity exerting their effects, the planner and post-attack manager must confront an economy with the following basic characteristics and basic constraints:

-there will be an immediate threat to population survival, requiring that necessities of life be provided to survivors;

-national objectives will be dominant over private objectives;

-basic economic institutions will be greatly crippled;

-expectations about the future will be unsettled;

-there will be a radical alteration in patterns of relative scarcities;

-there will be an abrupt decline in consumption standards.

The management of an economy with these characteristics will require solutions to a number of interacting, continuing technological and organizational problems. In the survival phase after attack, "the central economic problem would be the distribution of existing stocks and goods in support of the effort to meet immediate threats to population survival". In the reorganization phase after attack, the central economic problem "will be that of getting production restarted and up to the level required to meet essential demands without drawing down inventories". In the phase of final recuperation, "the problem will be to follow a course toward desired goals in terms of production, consumption, and patterns of economic organization". For all phases, restoring the viability of the economy will require constant attempts to create the organizational forms which restore institutional processes for allocating scarce resources and services, before existing stocks have been depleted below critical points. Technological problems of resource availability will constantly constrain the kinds of organizational arrangements which must be designed or improvised.

As part of his intellectual framework for considering the problems of post-attack economic organization and institutions, Winter turns to methods and perspectives from welfare economics, especially Pareto's First Optimality Theorem. In this perspective, Winter considers types of "market failure" which will occur after attack and steps for dealing with these failures. Winter then moves to a detailed consideration of the economic dilemmas which will occur over a range of possible situations after attack. Of interest is Winter's detailed consideration of the ways in which variable attack assumptions create varied economic problems.

After defining the critical resource base required for resuming economic activity in the survival phase, Winter locates the critical organizational problems which must be met in the short term. These include:

-control over stocks of essentials;

-procedures for equitable distribution of essential stocks;

-operation of essential services.

Assuming that the survival phase can be negotiated, the central problems of the reorganization phase can be confronted. These problems focus on the achievement of viability: essentially, the restoration of production to meet shorter and longer term needs without exhausting inventories in the interim. The problem of achieving viability emerges as the most critical purely economic problem of post-attack society and its institutions. Winter demonstrates the problems in achieving viability through an illustrative model, and then he applies this model to economic reality, by reviewing the problems in actually using probable patterns of post-attack resources in a range of critical sectors. He draws on historical examples to illuminate the dilemmas of centrally managing resources and institutions to achieve viability. After defining the most general alternatives of economic policy as being between relative centralization and compulsion in economic organization and relative decentralization with private incentives, Winter makes a number of pragmatic proposals for restoring a market economy. The proposals recognize that planners' concepts of tight post-attack economic control may be based partially on fantasy.

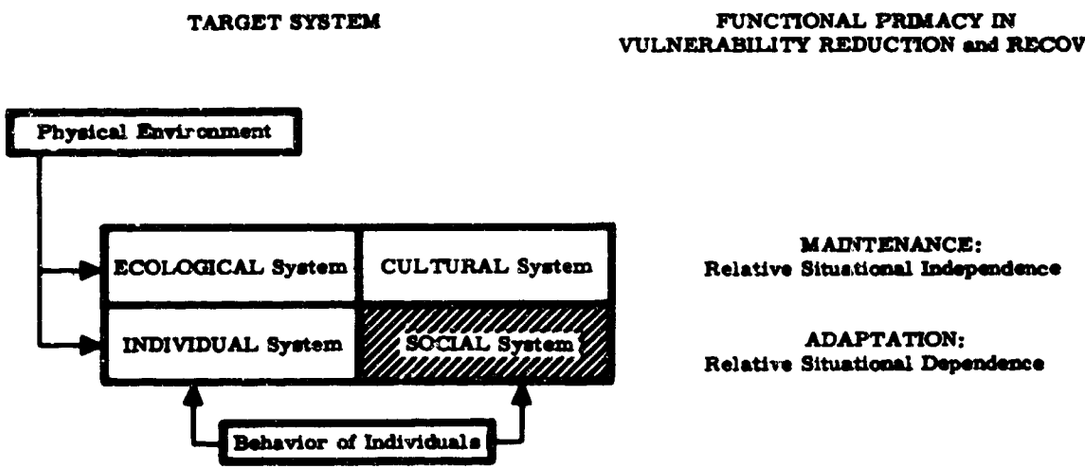
If the problems of achieving viability have been met in the reorganization phase, then the recuperation phase with its more ambiguous goals gradually begins. Winter proposes a model of recuperation time and recuperation possibilities based on surviving physical capacity and capital, per capita consumption needs, continuing demands to maintain viability, and the requirements for achieving levels of output each year which move toward the recovery of the pre-attack level of Gross National Product. This model provides a certain degree of support for the proposition that no more than about two decades would be required for "recuperation", defined narrowly. Winter holds that "If viability were achieved at all, it would almost certainly be achieved with enough 'room to spare' to make full recovery possible in two decades or less". And, "to doubt the feasibility of recuperation in two decades is essentially to doubt the feasibility of achieving viability --- the zone between 'collapse' outcomes and 'recuperation in two decades' outcomes is too narrow to be interesting".

In summary, "The most critical question about the economic consequences of nuclear war is whether economic viability can be achieved --- whether production will recover to a level adequate to support the survivors before the grace period

afforded by surviving inventories comes to an end". How economic institutions can be organized to meet this challenge is probably the most crucial strictly adaptive problem confronting the social system after attack.

Figure IVa-1

PRIMARY TOPICAL EMPHASIS OF CHAPTER IV



Chapter IV

SOCIETAL RECOVERY AFTER NUCLEAR WAR: THE ECONOMIC DIMENSIONS

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I. Introduction

Investigation of the implications of nuclear war is an intellectual activity that has as its primary object the avoidance of situations in which the most relevant data would become available. The secondary object of the activity is to guide the development of measures that promise to mitigate, in some degree, the disastrous consequences of a failure to achieve the primary objective. Undeniably, these features lend a bizarre quality to the activity. They give a superficial plausibility to the argument that an intellectual interest in the subject may be indicative of a failure to appreciate its proper ends. Hence, they impose upon the investigator the necessity of explaining why he has devoted himself to the systematic development of propositions that hopefully will never be subjected to definitive empirical test.

National Policy and Nuclear War

Whatever the present remoteness or immediacy of the threat of nuclear war, it is plain that from day to day national policy decisions are being made that relate to that threat and have some impact, perhaps undeterminable, on its future severity. It is equally plain that the extent and direction of that impact is not the only consideration bearing upon the decisions made, nor is it the only consideration explicitly invoked in discussions of alternative policies. Other objectives--in particular, the maintenance of national independence and all that it implies--are highly valued, especially in the context of policy discussions relating to the near

future.[1] Responsible decision making demands, therefore, a weighing of the competing demands for minimization of the threat of nuclear war and minimization of the threats to attainment of other national objectives. The greater the ignorance of the true dimensions of these various threats, the greater the danger that they will be weighed erratically in a tense situation. It is a premise of this paper that responsible policy discussion and decision making in the nuclear age must involve a confrontation with the best description of the implications of nuclear war that is attainable--however imperfect that description may be--and however unpleasant the confrontation.

While there is probably wide agreement that responsible decision making must be based on the fullest possible understanding of the implications of nuclear war, there is undoubtedly less agreement about the desirability of a full investigation of the possible usefulness of preparedness measures in mitigating the impact of a nuclear war. To some extent, the disapproval of such an investigation is derivative of a policy position on the current desirability of undertaking specific preparedness measures[2]--namely, that the available information indicates strongly that such measures would be an undesirable use of the nation's resources. There is, however, no connection in logic between the desirability of better understanding of the preparedness problem and the desirability of undertaking specific measures. A more accurate appraisal of the problems may as easily reflect adversely as favorably on any given program of preparedness measures. More importantly, any judgment of the current desirability of particular measures is necessarily based in part on some views as to the current international political and strategic situation,

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[1] Many persons who are urgently concerned with present threats to national security and independence would probably grant that, in the long run, modern technology is likely to force fundamental adjustments in the nation-state system. In this sense, they would agree, the threat of nuclear war may ultimately have to be dealt with at the expense of national independence. See, e. g., Herman Kahn, Thinking About the Unthinkable (New York: Horizon Press, 1962), Chapter 7 and pp. 230-231.

[2] The words "preparedness measures" and "preparedness policies" are used throughout this essay to refer to a range of policies significantly wider than that commonly associated with the words "civil defense."

including views on the probable size and nature of a nuclear war and the probable list of participants. Whatever the subjective confidence with which such views may be held, history suggests that it would be prudent to regard them as being subject to radical change under the impact of events occurring over a rather short period of time. On the other hand, many of the least understood aspects of the preparedness problem relate to features of nuclear weapons and of our society that are much more likely to remain relatively constant over a long period. The desirability of improved understanding of these aspects of the problem is largely independent of specific judgments about the current context.

This paper is an examination of a rather poorly understood aspect of the preparedness problem--the assessment of the impact of nuclear war on the economic activity of the nation, the determination of conditions under which a meaningful degree of economic recovery might occur, and the development of policies which would enhance the prospects for such recovery. Although two decades have passed since the first nuclear explosions, this paper is still very much a preliminary examination of the economic implications of nuclear war. The number of directly relevant studies that can be cited is very small in comparison with the magnitude of the problem--or in comparison with the literature on relatively minor facets of economic policy problems of the traditional sort. More specifically, the existing literature is deficient in its treatment of the question of how economic activity would be guided in relation to national goals in the aftermath of a nuclear war, and some critical questions that are close to the boundaries between economics and other social sciences have barely been defined, let alone investigated. The present paper gives, therefore, considerable attention to the task of defining the questions in these areas and suggesting theoretical and empirical approaches that might be taken to resolve them. Although the primary emphasis throughout is on developing appropriate conceptual apparatus rather than on reaching substantive conclusions, it is of course true that this work cannot be done in a complete factual vacuum. Available factual knowledge is brought to bear on the problem of developing a useful conceptual structure.

Questions of Methodology

Before proceeding with the main task, it will be helpful to attempt to clarify the special methodological problems of this bizarre intellectual activity. How, for example, is it possible to engage in a scientific discussion[3] of the proposition: "Gross national product [GNP] in 1965 prices could be restored to its pre-war level in ten years after an attack in which nuclear weapons with an aggregate yield of under two thousand megatons were exploded over a reasonable list of military and industrial-population targets in the United States"?

If this proposition were of purely scientific interest, then discussion might reasonably be focused on preparations for ascertaining its validity if the appropriate conditions were to occur--as if one were preparing to make scientific use of an earthquake or an eclipse of the sun. The purely scientific interest in the proposis, however, negligible; the primary interest lies in its relevance to policy decisions that might be made before such an attack occurred. That being the case, it is clear that the possibility of useful scientific discussion of the proposition turns on its being understood as having implications that can be tested by reference to data either in existence, or attainable in the absence of nuclear war.

The methodological problem here differs only in degree from that presented by any case of genuine prediction; it is, essentially, the classical philosophical problem of induction. Logic alone can provide no assurances that regularities observed in the past will continue to be observed in the future, whether these regularities have to do with the motions of the planets or the motions of the gross national product. No proposition about the future can be assessed scientifically, therefore, unless it is first agreed that presently available evidence is relevant to its validity. To put it another way, the validity of a genuine prediction is not discussable (prior to the relevant "experiment") unless the prediction is understood to be one of a class of related statements that will stand or fall together, and some of which are testable against presently available evidence. It is the character of the presently available

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[3] If "scientific" has too narrow a connotation, the reader is urged to substitute "rational and systematic."

evidence that leads us to have greater confidence in predictions of next year's eclipses than of next year's gross national product, and more in predictions of next year's gross national product than in predictions of the gross national product ten years after a nuclear war.

The difference is explained in large part by the past record of successful prediction of eclipses, as against the indifferent success of various methods of predicting gross national product, and, further, as against the complete absence of any experience with methods for predicting the implications of nuclear war. It should be noted that a record of successful prediction by a procedure that remains essentially fixed is much stronger evidence in support of a scientific theory than a mere showing of consistency between the theory and all the experience accumulated up to a certain point in time. The problem of predicting the GNP illustrates this point; it is not a difficult matter to develop a model of the determination of the gross national product that will fit the available time series of GNP data extremely well--all that is required is a fairly liberal use of explanatory variables. What is difficult is to develop a model that will give a good fit to data other than those from which it was derived.

Aside from the past record of successful prediction with the same procedure, the most important factor affecting the confidence in a prediction is the degree to which the procedure has a place in an extensive and well articulated body of theory that, taken as a whole, successfully confronts a wide range of different bodies and types of data. That is, a specific procedure for predicting the answer to a specific question acquires a good deal of "prestige by association" if it has an intimate logical connection with other procedures that have a record of success. This is the reason why predictions of the answers to questions in the physical sciences sometimes carry a very high degree of subjective confidence in spite of the complete absence of any experience with the specific question raised. Or, to return to the problem of predicting the gross national product, the skeptical reception accorded models with an excellent empirical fit to GNP data is in part attributable to the absence of strong confirmation of the assumptions of such models when tested against other types of data, e. g., cross section observations on decision making units.

Clearly, in the absence of any experience by which to judge the ability of various procedures to predict the consequences of nuclear war, the only available standard for such judgments is the degree to which a given procedure is derivative of a theory that is well corroborated in other applications. This standard excludes from scientific discussion all statements to the effect that nuclear war is "not comparable" to any situation that has occurred previously, if such statements are understood to mean that events after a nuclear war would be governed by their own peculiar laws, unrelated to any present reality. These statements merely assert the impossibility of useful discussion; they do not carry any weight for or against specific prediction. If the logic of such statements is applied impartially, it puts the prediction "nuclear war would be horrible" on the same level of meaninglessness as the prediction "nuclear war would be delightful." To defend the prediction that nuclear war would be horrible, it is obviously necessary to grant at the outset the relevance of presently available evidence not only on the physical and biological effects of nuclear weapons, but also on the reactions of human beings to particular experiences.

There remains, of course, an enormous range of possible disagreement among investigators who are equally willing to agree that presently available evidence is relevant, but who differ on the degree of relevance of specific bodies of data. In the absence of a scientific court of unquestioned impartiality, such differences cannot be finally resolved. They can, however, provide a stimulus for a continuing effort to resolve particular issues, provided that the attempt is made to develop a coherent theoretical framework within which tests of alternative hypotheses can be carried out. For example, predictions of economic recovery based on the assumption of a fairly efficient use of surviving resources may be objected to on the ground that the general chaos and breakdown of economic institutions would preclude efficient utilization. If this objection is taken to mean that a nuclear war would present historically unique features which would automatically preclude the efficient use of resources, then the issue raised is unresolvable. But if it is taken to be a general hypothesis about the effects of war or other catastrophes on economic organization, then there is a wealth of data available from which one might attempt

to assess the extent of the probable impact on efficient allocation, the rate of spontaneous development of new economic institutions and relationships, the role of governmental policies in mitigating or accentuating the difficulties, and so forth.[4]

Although the problem of predicting the implications of a nuclear war does not present any methodological difficulties of fundamental novelty, the substantive difficulties are nevertheless enormous. When the question is finally raised as to the relevance of particular research results to the choice among alternative policies, there can be no escape from the task of assessing the confidence that should be placed in an extension of the results to the unprecedented situation of nuclear war. About all that can be said of this assessment is that there is no strictly scientific procedure for making it, and that the case for great caution seems persuasive. Indeed, a part of the research task is to set forth explicitly the range of alternative predictions that are derivable from theories with roughly comparable support from existing data. With this range of predictions before him, the cautious policy maker can attempt to develop policies whose performance will be insensitive to the differences among the predictions. But he cannot be given scientific assurance that the full range of possibilities has been visualized, let alone that any single outcome will materialize. Thus, when a decision must finally be reached, the belief that it is desirable to let the decision be influenced by the best scientific advice available can only be an article of faith.

Questions of Value and Ideology in an Economic Analysis

The elementary textbooks summarize the central economic problems of society by three questions: What shall be produced? How shall it be produced? For whom shall it be produced? In societies where the pursuit of private gain is a major determinant of the answers to these questions, the study of economics focuses on the processes by which prices and markets coordinate individual decisions and generate answers to the questions which have certain elements of

[4] For a discussion of the role of government economic policies in some historical instances of disaster, see Jack Hirshleifer, Disaster and Recovery: A Historical Survey (Santa Monica, Calif.: The RAND Corporation, RM-3097-PR, April, 1963).

rationality. But the three questions can also be understood to refer to the structure of the economic system itself, rather than to the details of the allocation processes generated by any particular system. To confront the problem of economic recovery after a nuclear war is to confront the three questions in this more fundamental sense, for there is clearly no guarantee that an event of such enormous proportions will leave the basic institutions and premises of the economic system unaltered.

Consider first the question of what shall be produced. As a first approximation to a definition of economic recovery, it is plausible to associate recovery with the restoration of pre-attack levels of production, either in absolute terms or per capita terms, and either in the aggregate or in detail. It is not obvious, however, that recovery in this sense would appeal to the survivors of a nuclear war as a desirable goal, or that the objective of economic preparedness measures should be to facilitate recovery in this sense. It is conceivable that the experience of nuclear war might produce a general change of attitudes toward material satisfactions, or toward the conditions that an extensive division of labor imposes upon social life in general. It is possible that a sharp decline in consumption relative to previously attained standards would greatly affect the subjective urgency of immediate as against future consumption in one direction or the other, so that the general willingness to sacrifice immediate consumption to the cause of "recovery" might be either very great or very small. It is probable that the international political context following a nuclear war would be sufficiently different from the present one to produce dramatic shifts in the levels and types of military expenditures that would seem appropriate, in the foreign sources of basic materials, and in export markets. It is likely that there would be a great many shifts in the detailed structure of demands for goods and services, some of them traceable to changed environment (e. g., the effect of higher incidence of some diseases on the demand for medical care), others reflecting the impact of the war on the composition and geographical distribution of the nation's capital stock, and others produced by more subtle mechanisms. There is, in short, no strong presumption in favor of the proposition that the pre-attack level and composition of production would or

should be regained, nor is there an obvious measure of the total output of the post-attack economy that is clearly relevant to the attainment of post-attack goals.

Consider next the "how" question--understood as referring to the mechanisms by which economic activity would be guided, rather than to the technological details of production processes. Here there is a widely held presumption to the effect that the enormous economic difficulties of the first months and years after a nuclear war would necessitate a great increase in governmental control over the allocation of resources, but that "recovery" would bring with it a reversion to present ways of doing things, including presumably the reliance upon private ownership and "free enterprise" as basic elements of economic organization.[5] The sources of this view, and the objections to it, will be discussed in detail in Section II. For present purposes, it suffices to remark that while the demand for rational centralized control of economic activity may indeed be high after a nuclear war, the supply forthcoming may be meagre and the price in terms of foregone opportunities extremely high. One can as reasonably argue that the limited capabilities of the surviving government would dictate an economic policy of complete laissez-faire as that the limited capabilities of the private ownership economy would dictate a reliance on "disaster socialism." Furthermore, it is not easy to predict the shifts in values and ideological positions relating to alternative forms of economic organization that might follow from the experience of the war and the ensuing attempts to deal with economic problems. It is correspondingly difficult to estimate the influence of such shifts on the direction of evolution of economic organization in the years following the war.

Finally, consider the "for whom" problem. At present, this question is largely settled by the distribution of income, which itself is influenced by patterns of inheritance, by the prices for services of individuals that are established in the market place, and by the laws relating to taxes and transfer payments. The distribution of purchasing power as among different states and regions, and also among

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[5] See, e. g., Office of Emergency Planning, The National Plan for Emergency Preparedness (Washington, D. C.: Government Printing Office, 1963); Neil J. Smelser, "Methodological Issues in the Analysis of Nuclear Attack and Recovery," Chapter VI below, pp. 636-643.

occupations, is affected to some extent by political decisions at the federal and state levels. A nuclear war and its chaotic aftermath would leave the surviving wealth of the society capriciously distributed over the surviving population--assuming that private ownership of most of the nation's wealth would not be abandoned in the face of the enormous confusion of property rights. Wage and salary incomes would probably fall to a minute fraction of their former levels for some period of time; and when they recovered, the pattern of relative scarcities of different types of skills might be drastically different from what it had previously been. Governments at all levels would employ drastically new systems of taxes and transfers to obtain resources and relieve in part the distress of the population; direct conscription and redistribution of various types of property would be a distinct possibility. Attempts by the Federal Government to mitigate drastic differences in the material well-being of different geographical areas might encounter strong resistance from the relatively fortunate areas.

With respect to each of the three questions, we find reasons to doubt the appropriateness of using existing patterns of values as a standard by which to judge the performance and organization of the post-attack economy. Values, in the widest sense, will be altered to a greater or lesser extent by a nuclear war and its aftermath. The exchange values of goods and services will change, as will the values attached to work and leisure, consumption and savings, the values and ideologies attached to alternative patterns of national economic organization, and the attitudes relating to the legitimacy and equity of distributions of wealth and income among persons, occupations, and regions. But if the economic system is potentially mutable in so many respects, the concept of economic "recovery" becomes elusive. The analyst and the policy maker concerned with preparedness measures are confronted with serious ambiguities in the definitions of their respective tasks.

There are, in fact, three related sources of ambiguity involved here. First, there is a lack of unanimity in the society at present as to the proper uses of the nation's resources and the most appropriate forms of economic organization. For example, there are fundamental differences of opinion as to the proper role of government in economic life--as the 1964 election campaign reminded

us. There are disagreements about the broad features of the allocation of resources among, for example, military and space activities, the accumulation of consumer durables by those who can afford them, the provision of the necessities of life to those less advantaged and a degree of opportunity to their children, and so forth. Almost inevitably, such disagreements about the present situation imply corresponding disagreements about the desirability of hypothetical post-attack situations. One individual might regard private ownership of basic industries as being an essential feature of full recovery, while another might be indifferent to this question but much concerned that inequalities in the distributions of wealth and income should be no greater in the recovered economy than at present.

The seriousness of ambiguity to which these disagreements contribute is compounded by the fact that the actual structure of the present economic system is highly complex and very inadequately rationalized by any widely accepted ideological position. This absence of a coherent rationale for American economic practice is reflected in the recurrent efforts to find a name for the system that is more suggestive of its true nature than "capitalism" and "free enterprise." The neutral phrase "mixed economy" and the charged one "welfare state" have their merits as names, but they are merely names and not the titles of any coherent and widely known body of politico-economic doctrine. Thus the analyst is left to rely on his own devices in the attempt to distill the "true" principles underlying present practice and to determine how those principles might be applied in a radically different situation.[6]

A second source of ambiguity in the recovery concept is the possibility of a general and systematic shift of basic values as between the present population and the population of survivors of a nuclear war. Some illustrations and possible mechanisms of such a shift have been noted above. If one assumes for the sake of argument that it is possible to arrive at a useful summary of present values relating to the economic system, and that it is possible to predict the alterations in

[6] It is suggested in Section II of this essay that the rather abstruse subject of theoretical welfare economics comes reasonably close to providing the required conceptual framework.

these values that nuclear war would produce, then the question arises as to whether it is the present values or the predicted ones that provide the basis for a definition of recovery. Shall the objective of preparedness measures be taken to include the manipulation of the value system of the survivors of a nuclear war, or the attempt to constrain post-attack behavior to conformity with present values? Or should the alterations in values be taken as given, and the attempt made to design measures in conformity with the altered values? Would we, if we could, confront the survivors of a nuclear war with a choice between free enterprise and famine? Should the means to preserve national unity and independence be assigned a priority in preparedness measures that is commensurate with our present attitudes toward these objectives, or should we attempt to anticipate their place in the post-attack hierarchy of goals? If present values are relevant for some purposes, and post-attack values for others, what is the principle that controls the distinction?

The third component of ambiguity in the recovery concept is the anticipated absence of unanimity within the post-attack society. To some extent, preparedness measures can influence the distribution of political and economic power among survivors, and that distribution will influence in turn the political and economic evolution of post-attack society. Different groups will attempt to impose different definitions of recovery on the society. It may well be the case that it is easier to predict the general pattern of the differences than it is to predict the general and systematic shift of values between present and post-attack society. Thus the influence of preparedness measures on the distribution of political and economic power may be the most important mechanism by which post-attack decisions on resource allocation and economic organization can be influenced. However, the deliberate use of this mechanism would raise the same issues between present and post-attack values that were noted previously. The task of predicting the distribution of political and economic power among survivors has, in any case, an intimate connection with the problem of defining recovery.

Clearly, the existence of these three ranges of disagreement on the question of which values are to be preserved or restored is a formidable obstacle to the formulation of a precise, relevant and generally accepted definition of recovery. It would be fallacious, however, to assert that the logical priority of these difficult

issues implies that any discussion of recovery from nuclear war remains meaningless until they are fully settled.

We are protected from the necessity of a stark confrontation with them by the existence of a fourth range of disagreement on the problems of resource allocation and economic organization after a nuclear war: in the absence of a clearly defined picture of possible post-attack situations, no single individual is likely to be capable of a careful comparison of them in terms of what he considers to be his present value system. A clearer formulation of the problems of value that are involved can be achieved only to the extent that the facts of the post-attack situation can be predicted and ranges of concrete policy alternatives defined.[7] Furthermore, it should be noted that agreement on objectives is neither a necessary nor a sufficient condition for agreement on policies.[8] Hence, the analysis and elaboration of particular preparedness policies may be fruitful even in the absence of prior agreement on objectives.

Although a full and precise resolution of the various difficulties raised here is neither attainable nor necessary, the remainder of this essay does not purport to be completely neutral toward them. Rather, it is based on certain general premises of fact and value which should be made explicit.

First, it is assumed that in the event of nuclear war the Federal Government will exist continuously through the war and its aftermath, that the United States will not suffer occupation of its territory, that the office of President of the United States will not be vacant for more than a few days at a time, and that the legitimacy of the Federal Government's authority will not be seriously contested during the war or within a few weeks thereafter (if at all). The attempt is made in this essay to discuss post-attack policy alternatives in terms in which they would be confronted at the upper levels of the surviving government.

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[7] For elaboration of the view that values are defined concurrently with policy positions, see C. E. Lindblom, "Policy Analysis," American Economic Review, XLVIII, 3 (June, 1958), pp. 298-312.

[8] Ibid.

Second, the following hierarchy of values is assumed to be roughly descriptive of the views not only of the surviving leadership of the federal government, but also of the individuals who are now or will in the future be most concerned with the development and implementation of preparedness policies: The highest priority is attached to minimizing the decline in the population produced by the war and its aftermath. Second priority goes to the maintenance of national unity within the present boundaries of the United States. Third priority is assigned to the minimization of immediate threats to national independence. This hierarchy is not, of course, absolute. Some sacrifice of higher priority objectives would be accepted if it would make possible a much higher level of attainment of lower priority objectives. However, the claim to relevance of this hierarchy rests in part on an assumption that, as a matter of fact, attainment of the higher priority objectives in the post-attack situation would be essential to the attainment of the lower ones. For example, it is assumed that national unity and independence could not in fact be obtained by the loss of a large fraction of the population.

As a corollary to the foregoing, it is explicitly assumed that questions of national political and economic structure are subordinated as long as there is an immediate danger of failing to achieve the three objectives just set forth. For example, if socialism and presidential dictatorship are the price of meeting the emergency, the price will be paid. However, it is also assumed that the longer run implications of alternative forms of emergency organization are relevant. As between two forms of organization that are indistinguishable in terms of their ability to achieve the three highest priority objectives, that form which seems most consistent with pre-attack values will be preferred.

Third, preparedness policies would continue to be controlled by the priorities indicated above even if it were predicted that these priorities would not be shared by the survivors of a nuclear war. Such a prediction would be regarded as posing a problem to be solved by preparedness policies, not as a fact to which such policies should be adapted. The same reception would be accorded to a prediction that the political system of post-attack society would not ultimately display the general characteristics of the present Western democracies.

Fourth, it is assumed that the Federal Government will attempt to influence economic activity so as to bring about rates of growth in real GNP per capita at least equal to the historical average (conservatively, 1.5% per year).[9] This, of course, does not imply that the government's efforts will be successful, or even that the policies chosen will be productive.

Finally, nothing in the foregoing discussion or in the remainder of this essay is intended to be prescriptive of a particular course of action or of particular value judgments. The various assumptions are intended to be descriptive of a vague consensus within which policy might actually be formed. The analysis here is intended to be persuasive only insofar as it contributes to a clarification of issues and a better appreciation of the relevance of certain facts. In particular, the author does not consider a discussion of the implications of nuclear war to be a proper occasion for the implicit advocacy of his program for reform of the existing society.

An Overview of This Essay

Section II is concerned with the definition and structuring of the economic problems peculiar to post-attack society. A distinction is developed between the technological aspects of these problems, (those controlled by the physical and biological conditions of production and the support of the population), and the organizational aspects (having to do with economic institutions, the coordination of economic activities, incentives, etc.). The methods of theoretical welfare economics are described briefly and their relevance to problems of post-attack economic organization is indicated. A scheme of time phases of economic recovery is set forth. In the immediate post-attack phase, the survival phase, the central economic problem would be the distribution of existing stocks and goods in support of the effort to meet immediate threats to population survival. In the reorganization phase, the central problem will be that of getting production restarted and up to the level

[9] The precise interpretation of this assumption presents some difficulties, in view of the problem of choosing appropriate prices by which to measure "real" GNP. However, the problem is not as serious in this context as in the context of an attempted comparison of present and post-attack levels of GNP.

required to meet essential demands without drawing down inventories. In the final or recuperation phase, the problem will be to follow a course toward desired goals in terms of production, consumption, and patterns of economic organization.

The remainder of the essay treats in turn the particular problems of each of the three phases. The existing knowledge of these problems is summarized, and the most important gaps in present knowledge are identified. The central issues of national economic policy in the three phases are set forth, and the range of organizational devices for formulating and implementing appropriate policies is discussed.

II. The Economic Problems of Post-Attack Society

Distinctive Features of the Post-Attack Economy

Undoubtedly, the most important economic consequence of a nuclear war would be a sharp increase in the scarcity of economic resources in general relative to the urgency of the wants to be satisfied. But since the scarcity of resources relative to wants is the fundamental fact on which the entire subject of economics is built, it can hardly serve to characterize the distinctive economic problems that would be created by a nuclear war. As a preliminary step toward analysis and description of those problems, it will be helpful to consider in general terms the various factors which differentiate "post-attack economics" from economics in general. Fortunately for the analyst, these factors appear in various combinations in other situations. Taken together and considered in contrast to the present situation of the American economy, they constitute a very special set of economic circumstances.

The Threat to Population Survival: Providing Necessities of Life to Survivors. Foremost among the distinguishing factors is the probable existence of a substantial doubt that the economy would prove to be capable of providing the necessities of life to the entire population that survived the war itself. In fact, it is virtually certain that in the immediate aftermath of a nuclear war some lives would be lost as a result of the inability of the economic system to provide adequate

amounts of shelter, food and water at the places where they were needed. When the immediate threats had passed, there would remain a substantial uncertainty as to the ability of the economy to support the survivors when surviving inventories of necessities were exhausted.

Differences in the performance of the economy that would be of little consequence under present economic conditions might, under post-attack conditions, represent the difference between life and death for hundreds of thousands of people. Differences in performance that loom large in the historical record of the American economy--the difference between 1929 and 1933 performance, for example--might under post-attack conditions mean the difference between the steady restoration of a modern economy and a catastrophic collapse to a subsistence economy supporting a small fraction of the present population. While many national economies today operate close to the margin of subsistence for a large fraction of the population, they do so under comparatively stable conditions, and the threat of a decline to a position far below the margin is not imminent. There are very few historical precedents for a situation in which the range of uncertainty about the performance of the economy would imply such a large range of uncertainty about population survival.

Dominance of National over Private Objectives. A related factor is the reasonable expectation that, at least in the minds of those concerned with the direction of national economic policy, the standards by which economic performance would be judged would be dominated by a concern for the achievement of national objectives--as opposed to a concern for creating an environment in which individuals could effectively pursue their own objectives. This point was noted in the preceding section, in the form of an assumption that a concern with national objectives of population survival, national unity and national independence would override concerns with the forms of political and economic organization. For example, respect for property rights would probably not inhibit the Federal Government from carrying out massive redistributions of existing stocks of food, fuel, clothing, and other necessities if such redistributions were required to stave off major population losses from famine and exposure, nor would it inhibit government ownership and operation

defense-related industries if this seemed to be the only means to meet the mili-
ry requirements of national independence. The assumption that the Federal
overnment will do "whatever is necessary" to achieve essential national objectives
defensible on the basis of the historical record of government action in times of
tional emergency; in addition, it is explicit in present emergency planning. Of
ourse, it is assumed as well that there would be a rough proportionality between
e extremity of the emergency and the extremity of government action.[10]

Crippling of Basic Economic Institutions. A third distinctive feature of
e post-attack economy would be the great crippling of the basic institutions of the
conomic system. Most prominently, the institution of private property would be
everely shaken by the deaths of millions of individuals, the destruction of enormous
nounts of real wealth, and losses of securities and records of transactions. The
ormal processes of estate settlement, bankruptcy proceedings, elections of boards
directors, and the like would be utterly inadequate to untangle the snarl and deter-
ine who would own and control the nation's surviving assets. Massive insolvency
ould overwhelm the banking system and, in the absence of drastic emergency
easures, the entire money and credit system would probably collapse. At least

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[10] The following passages from The National Plan for Emergency Prepared-
ss, Ibid., are relevant here: "The actual occurrence or imminence of nuclear
tack would require the immediate implementation of comprehensive emergency
easures to mobilize the nation's resources for the defense, survival, and eventual
covery of the United States. Action would be necessary in connection with mili-
ry operations, wartime functions of the Government, protection and care of the
opulation, stabilization and management of the economy, maintenance of law and
der, protection of essential facilities, control and allocation of all essential
sources, and implementation of other programs necessary to national survival
d recovery." (Chapter 1, "Basic Principles," p. 2, emphasis supplied. This
ssage was revised considerably in the version of the National Plan promulgated
December, 1964.) "Although the Government must and will take whatever action
required to insure national survival in times of great peril, this does not mean
e end of personal and political freedoms... Consequently every effort shall be
ade to preserve... private operation of industry, subject to government regulation
ly to the extent necessary to the public interest." (Op. cit., p. 5, emphasis
pplied.) Presumably, the word "hopefully" is tacitly understood in the phrase"
. this does not mean...."

a temporary loss of confidence in the currency would be a distinct possibility and would further complicate the monetary problems. Governments at all levels would have enormous difficulties in raising funds, and resort to inflationary finance by the Federal Government might severely inhibit the recovery of the normal processes of monetary exchange. The courts would be crippled by the massive destruction of records as well as by losses of personnel and facilities. The entire structure of normal economic regulation by state and Federal governments would quickly become irrelevant, and the agencies with regulatory functions might no longer exist. Indeed, it would be hard to think of an economic institution that would not be highly vulnerable under a nuclear attack of plausible size and distribution.

Unsettling of Expectations about the Future. The effects of the war on basic economic institutions would tend to aggravate another one of the distinctive problems of the post-attack economy: Expectations about the future would be extremely unsettled. In the drastically altered circumstances of the post-attack economy, the elaborate fabric of mutually consistent expectations that provides the context for rational economic action would be torn and shredded. No longer would there be a reasonably certainty that contracts would be performed, that the value of money would not change abruptly, that the relative prices of commodities would be approximately the same in the future as they were in the past, that governments would not resort without warning to new systems of taxation, that people would respond to material incentives in familiar ways. Individual economic agents would be faced with the destruction or inacessibility of accustomed sources of supply of the things they purchase and accustomed markets for the things they have to sell, and would have to search out entirely new patterns of activity. The reasonable consistency of views of the future held by different individuals, largely a consequence of stable conditions, is undoubtedly an important factor contributing to the efficiency of economic systems in which decision making is widely dispersed. In the absence of this consistency, the intermediate and long range plans of different individuals would either fail to mesh, or, in anticipation of that possibility, such plans would not be made at all.

Radical Alteration of Pattern of Relative Scarcities. A nuclear war involving massive attacks on urban-industrial targets would leave the economy with a radically altered pattern of scarcities of skills and productive facilities. The destruction of plant and equipment might be minimal in some industrial categories, while in others it would be virtually complete. The occupational groups in the labor force that are highly concentrated in large cities would presumably suffer disproportionately large losses. Since people tend to live close to their places of work (on the distance scale appropriate for large yield nuclear weapons), disproportionate destruction of physical plant in a given industry would tend to be accompanied by correspondingly high losses in the associated skill groups. Disruption of the transportation network would give rise to new patterns of interregional trade, with further implications for relative resource scarcities within regions. In some cases--agriculture and water purification, for example--the effects of the war on the natural environment would amount to the destruction of existing categories of productive resources (uncontaminated land) and their replacement by physically altered resources (contaminated land). Labor supplies would be altered, not only by deaths and disabling physical injuries, but also by possible psychological effects of war experiences, shifts in attitudes toward work, more hazardous working conditions, and changed contractual relationships. Economic recovery would involve a gradual reduction of these various distortions, but in the early stages of recovery the attempt to deal with them would involve resort to methods of production much different from those used pre-attack.

Abrupt Decline in Consumption Standards. Finally, the economic situation following a nuclear war would present an extreme example of an abrupt decline in consumption standards for an entire national population. It may be suggested that the process of downward adjustment of consumption aspirations would be painful and possibly productive of distinctive patterns of social unrest.

Summary: "Post-Attack Economics". To summarize, the study of "post-attack economics" is essentially concerned with marshaling facts and developing conceptual and theoretical structures bearing on six distinctive features of the

post-attack economic situation: the threat to population survival, the dominance of national objectives, the crippling of basic economic institutions, the unsettled state of expectations, the radical alteration of patterns of relative scarcities, and the abrupt decline in consumption standards. These various elements are interrelated in many complex ways, and a major part of the task is to isolate subproblems for intensive study without losing track of crucial interactions.

Organizational versus Technological Considerations: A First Partitioning of the Problem

There is one partition of the total problem that is extremely useful as a step toward the isolation of tractable subproblems. This is the distinction between those features of the post-attack economic situation that would derive primarily from the technological conditions of production and the availability of resources on the one hand, and those that would derive from the institutional devices used to guide economic activity on the other. In examining the former, or technological, aspects of the situation, one views the economy as a gigantic, geographically distributed and complex machine. The machine can transform goods and services into other goods and services, according to known productive techniques taking place over time. It can, in particular, transform a supply of labor available at one time into an equal supply available at a later time by employing as additional inputs certain quantities of food, clothing, housing, etc.[11]

The machine does not function in an entirely deterministic way; on the contrary, in each time period the existing stocks of economic resources could be used in many different ways to produce different stocks in the next time period--or, alternatively, some resources could be withdrawn from the machine and used for other purposes. The functioning of the machine may not be completely deterministic in another sense as well; the outputs of some of its processes may be influenced by random, uncontrolled events (e.g., the weather). In principle, the

[11] In the post-attack context, the "production" of labor by consumption goods would be chiefly a matter of maintaining the labor supply by meeting physiological needs. The possible role of consumption standards as an influence on the birth rate need not be considered here.

machine could be programmed to carry out a specific, highly complex task over time--provided that the initial stocks of resources and the properties of the machine are such that the task is feasible. Alternatively, it could be programmed to maximize the achievement of designated objectives--provided that the objectives are specified with sufficient detail and internal consistency so that it is possible to say whether a given performance by the machine is superior, inferior or indifferent to another performance.[12] To give a concrete example, the machine might be programmed to maximize the gross national product at 1965 prices as of twenty years after being started (post-attack) and subject to the condition that the labor supply shall not fall below 99% of its initial value at any time.

The organizational aspects of the post-attack economic situation are those that relate to the way in which the productive machine will be "managed." That is, assuming that it is reasonable to assume the existence of certain technological limits to what could be accomplished with surviving resources, there remains the question of what would actually be done with the available technological possibilities. It is not, of course, necessary that the machine be managed at all, in the sense that anyone would attempt to direct it toward a clearly defined overall goal. Some of the "resources" upon which the machine operates would have objectives of their own, plus control over the use of other resources, and the actual functioning of the machine would reflect the exercise of that control in the pursuit of those private objectives. National leaders, who could more appropriately be cast in the role of "managers" of the machine rather than as a part of the stock of resources, might include in their view of national objectives a degree of freedom for the pursuit of private objectives.[13] Also, they might view a substantial degree of decentralization of control over economic resources as being both inevitable and potentially effective as a means to their own ends, and seek to influence the way in which that control would be exercised by broad policies rather than specific directives. But regardless of the institutional processes involved, it is clear that in one way or

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[12] If there are random influences on the machine, the maximization must relate in some sense to the expected results of alternative programs. More precisely, only a choice among probability distributions of outcomes is possible, and preferences must therefore relate to such distributions.

[13] See footnote 10 above.

another economic resources would be devoted to specific uses at specific times. All of those social phenomena which together would determine the specific performance of the machine within the range of technological possibilities are subsumed under the general heading of "organizational considerations."

Inevitably, the distinction between the technological and organizational considerations cannot be completely precise, and some of the difficulties with the distinction have doubtless occurred to the reader. There should be no misunderstanding as to the importance of these difficulties; their position at the boundary between two broad classes of problems is intended to be one of prominence, not of obscurity.

Consider, for example, the problem of labor supply. The individual member of the labor force represents, from the technological point of view, a supply of a resource which can be made available to the productive machine at a certain price in terms of other resources (necessities of life). From the organizational point of view, he exercises a considerable amount of effective control over the use of his own labor, and perhaps over other resources as well, and is therefore a part of the institutional apparatus that determines how the productive machine will operate. These two points of view must converge, however, on the specific question of whether the worker's labor will or will not be available for effective utilization in the productive machine. It will not be available if starvation has left him too weak to work; neither will it be available if hunger leads him to devote most of his energies to direct political action against the prevailing economic policies, or to attempt to make his livelihood by black marketeering or plunder. The strictly technological (physiological) conditions for the continued availability of his labor may be irrelevant as a result of his organizational role; alternatively, an impending failure to satisfy the technological conditions may become manifest in his performance of his organizational role. Clearly, the two sets of considerations must be analyzed consistently and simultaneously if the correct conclusions on labor supply are to be reached.

Another extremely important question at the boundary between the two sets of considerations relates to the resource requirements of organizational arrangements. The productive machine must supply the telephones, calculating machines,

paper, typewriters, clerks, judges, policemen, prison guards and so forth required by the institutional devices which direct the machine. Different organizational arrangements will have different resource requirements, and resources devoted to organization cannot in any case be devoted to productive activities in a narrower sense. Thus, the technological considerations of resource availability and production technique have a great deal to do with the feasibility and desirability of alternative organizational arrangements. For example, it might be the case that widely different forms of post-attack economic organization would be appropriate depending on whether most of the highly specialized resources located in Washington, D. C. did or did not survive the war. Consistency between the technological and organizational analyses of a given post-attack situation demands at a minimum that the resource requirements implied in the latter not be clearly contradictory of the conditions of resource availability postulated in the former.

The distinction between the technological and organizational aspects of post-attack economic problems reflects a sharp distinction between the techniques and factual bases of the two types of analysis. Given a tentative resolution of the troublesome and important issues at the boundary between the two areas, the technological analysis presents problems that are relatively familiar to economists. They are broadly similar to those confronted in other contexts, e. g., planning for war mobilization or for economic development. A large body of systematic technique exists, and the factual base is highly quantitative and well developed. The organizational analysis, however, presents many questions of fact that are intimately connected with issues of value and ideology in the field of economic organization, and disagreements on these issues has clearly inhibited the resolution of the questions of fact. Furthermore, the scientific problems involved (e. g., the cost and value of information, the nature of the employment relation, the goals and effectiveness of business leadership) appear to be intrinsically more difficult, and to be much less susceptible of quantitative treatment at an aggregative level. Hence, it is inevitable at the present state of knowledge that the organizational analysis be looser, more intuitive, and based on historical analogy to a greater extent than the technological analysis.

The Methods of Welfare Economics: Ideal Markets

The possibilities for scientific discussion of problems of national economic organization are, however, much greater than is generally recognized outside of the economics profession. Economists have struggled since the time of Adam Smith with the problem of the efficacy of Smith's famous "invisible hand."[14] In what sense and in what degree is it true that the pursuit by individuals of their own private economic interests, within a system of prices and markets based on private property and the enforcement of contracts, leads to results that are socially desirable? The problem can be given other formulations which raise a still wider range of issues; for example: given certain socially desired ends, what is the maximum role that the pursuit of private economic interests can play as a means to those ends? Or: to what extent do particular "non-economic" aspects of social organization tend to facilitate or limit reliance upon the pursuit of private economic interests as a basic element of economic organization?

Problems of such great scope are highly resistant to analysis, and to contend that a final resolution of them is in sight would be absurd. Nevertheless, the products of almost two centuries of systematic thought should not be neglected in any discussion of the forms of economic organization that would be appropriate under drastically altered circumstances. There are concepts and theoretical propositions available which at least provide a plausible rationale for many features of the present organization of the American economy, as well as a basis for rational and detailed criticism of that organization.[15] Furthermore, these concepts and

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[14] Adam Smith, The Wealth of Nations (New York: Random House, Inc., Modern Library Edition, 1937; original edition, 1776), p. 423.

[15] One has only to pose a reasonably specific question to recognize the complete inadequacy of ideological slogans for these purposes. For example: how does it happen that there is substantial and more or less successful resistance to government control of the price of steel in 1965, given that the principle of price regulation in the public interest became national policy in the case of the railroads in 1887? A framework inadequate for systematic analysis of that question is hardly likely to yield a useful analysis of alternative forms of economic organization after a nuclear war.

propositions can be directly related to the distinctive features of the post-atte economic situation, and thus provide some guidance as to the nature of the institutional innovations that might be called for.

Some Relevant Assumptions and Concepts from Welfare Economics. An attempt will be made here to summarize briefly the propositions in the highly technical and rapidly expanding literature of welfare economics that are most relevant for present purposes. One starts from the assumption that all of the individual consumers in the economic system have well-defined preferences with respect to consumption of goods and services (including leisure), and that their dealings in the market place are directed to the end of obtaining the most preferred consumption position possible. Producers (firms) are assumed to maximize their profits and resource holders to maximize their incomes; a single individual may be, and generally is, a resource holder as well as a consumer, and he may be a producer as well. A competitive equilibrium is a set of choices by all participants and an associated set of prices for all commodities such that demand and supply are equal in every market and every participant has attained the most favored position available to him, given the prices he confronts and assuming that these prices are not subject to influence by his actions alone. A Pareto optimum is a situation in which given initial resource availabilities and production possibilities, no single consumer can be made better off in terms of his own preferences without making at least one other consumer worse off in terms of his preferences.

With these concepts, one may state the First Optimality Theorem of welfare economics: If there are no non-market processes through which the market behavior of one participant influences the market opportunities or performances of another, then a competitive equilibrium is a Pareto optimum.[16] This technical proposition is the germ of truth in the Smithian doctrine of the invisible hand. The important condition on non-market interactions may be explained by an example:

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[16] For a self-contained and comparatively accessible treatment of this theorem and related basic propositions of welfare economics see T. C. Koopmans, Three Essays on the State of Economic Science (New York: McGraw-Hill, Inc., 1957), pp. 1-126, esp. pp. 46-49.

If Smith becomes more willing to eat hamburger because he observes Jones driving an automobile and wants to own one himself, that is a non-market interaction between Jones and Smith which, in general, will destroy the Pareto optimality of competitive equilibrium. On the other hand, if Smith is merely affected by what Jones tells him, independent of the economic decisions that Jones makes, then that is merely a part of the non-economic processes by which Smith's preferences are formed, and the condition for Pareto optimality is still met.

It should be noted that the First Optimality Theorem does not assert that competitive equilibrium is possible in the economy; it merely says that if such an equilibrium exists, and the non-market interactions condition is satisfied, then the equilibrium is Pareto optimal. In general, a great many Pareto optimal positions will be technologically possible in a given economy, all differing with respect to the levels of satisfaction experienced by different individuals. Some, none, or all of these Pareto optimal positions may be attainable as competitive equilibria, given an appropriate initial distribution of resources or units of purchasing power.

From the rarefied atmosphere of the First Optimality Theorem, the welfare economist descends to reality by a series of steps. At each step, he inquires as to the most important factors existing in reality that may obstruct the ideal functioning of markets envisaged in the theorem. He then seeks to invent institutional devices which will either remove the obstacles or replace a defective portion of the market mechanism by some arrangement that is likely to be more efficient.[17] However, at the present level of knowledge, the analysis of the functioning of these

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[17] For an excellent example of the sophisticated application of the principles of welfare economics to a policy problem see Kenneth J. Arrow, "Uncertainty and the Welfare Economics of Medical Care," American Economic Review, LIII, 5 (December, 1963), pp. 941-973. For an examination of existing government spending programs employing these principles, see Francis M. Bator, The Question of Government Spending (New York: Harper Brothers, 1960), esp. Chapters 6 and 7. For a treatment of government programs from a much different political viewpoint, but employing the same principles, see Milton Friedman, Capitalism and Freedom (Chicago: The University of Chicago Press, 1962), esp. Chapter 2. For a summary of welfare economics and a critique of its relevance, see J. de V. Graaf, Theoretical Welfare Economics (Cambridge, Mass.: Cambridge University Press, 1957).

alternative devices cannot be fully integrated with the analysis of market processes. As a result, theoretical analysis of the possible causes of "market failure" provides only suggestive guidance to the effort to find remedies for the defects. A few illustrations will now be given of types of market failure in the existing economy and in the post-attack context, and the general character of the remedies suggested by theory will be indicated.[18]

Types of Market Failure and Applications to the Post-Attack Situation. The first point to be noted is not strictly a type of market failure, but reflects the incompleteness of Pareto optimality as a criterion: There may be strong reasons for preferring one Pareto optimal solution to another, but no generally acceptable principle is available for choosing among them. In particular, unless one is willing to make specific value judgments endorsing the historical processes which have produced the existing distribution of control over economic resources and attaching normative significance to the resource valuations generated by the market process, there is no reason to view with particular favor the outcome of a completely "laissez-faire" solution to the market process. There is not, even in purest theory, any tendency for the market process to operate in accordance with any particular distributive ethic except the ethic which simply endorses the process itself. Hence, no violation of any principle of welfare economics is necessarily involved if governmental programs increase the levels of satisfaction of some members of the society at the expense of those of others, even if the redistribution replaces a situation that is Pareto optimal with one that is not. The economist may, however, be able to suggest ways of carrying out the redistribution that will be efficient in the sense that the resulting situation is Pareto optimal.

This point is of obvious importance in a society in which disagreements about the division of the economic pie are an important source of disagreements

[18] See Francis M. Bator, "The Anatomy of Market Failure," Quarterly Journal of Economics, LXXII, 3 (August, 1958), pp. 351-379, for discussion of the types of market failure and the indicated remedies.

about economic policy. It is of even greater importance in relation to the distinctive features of a post-attack situation: If it is granted that population survival and national unity are likely to be dominant national objectives, and that a nuclear war will result in a capricious redistribution of control over economic resources, then here is a specific sense in which the working of the unfettered market system is not to be trusted. There is no guarantee that even the healthiest survivor would be able to support himself by the sale of his labor, or that inequities would not give rise to crippling political conflicts. Massive redistribution of command over resources may be required in the interests of population survival and national unity. But such redistributions could be made in seriously inefficient ways; for example, use of the income tax to release purchasing power from the more fortunate might tend to increase the attractiveness of withdrawal from productive employment in favor of less productive activities offering greater opportunities for tax evasion. Ideally, the redistribution should be carried out once-and-for-all, and the tax liability of an individual should depend on his economic situation soon after the attack; i.e., his wealth, and not on his performance over a period of time, i.e., his income.

A second type of market failure is exemplified in "public utility" industries such as railroads, electric power, gas distribution, water, and telephones. In all of these cases there are underlying technological reasons why competition tends to be difficult or impossible to maintain in the long run. A single large firm can serve a given market at lower unit costs, or provide qualitatively superior service, than several small ones. For example, if a single railroad link between two points provides for more than enough capacity, unit costs will clearly be higher if two are built. A single telephone company provides a qualitatively superior service because every purchaser of telephone services can talk to every other purchaser. Under these conditions of "natural monopoly," competition tends to give way either to dominance by a single firm or a collusion among the survivors which produces approximately the same results as monopoly. If the good or service in question is highly essential to the prosperity and well being of large numbers of people, then abuse of the technologically-based monopoly

power is likely to lead to effective pressure for control of that power by one means or another.

In theory, the remedy for this type of market failure generally takes the form of a set of rules for operating the industry which departs in one way or another from profit maximization. In practice, the attempt to restrain the pursuit of private profits in these industries takes the form of government regulation of rates and service, or outright government ownership and operation. Unfortunately, the theoretical solution often suggests not merely that monopoly profits should be eliminated, but that the industry should be operated at a loss and the deficit made up by the taxpayers. For reasons which may or may not be sound in a wider context, there has been little attempt to implement this feature of the theoretical solution. Subsidies to regulated monopolies, or government enterprises operating at large losses, would generally be viewed with disfavor. Furthermore, the detailed structure of regulated rates bears little resemblance to the theoretical ideal. Rather, it amounts to public acceptance of the monopolistic practice of price discrimination--differences in price are unrelated to differences in cost.[19]

Whatever the merits and demerits of existing public policy toward the public utility industries, it is clear that those policies would be hopelessly irrelevant in the aftermath of a nuclear war. Consider, for example, the regulation of railroad rates. The regulatory standard for the general level of rates is that of "a fair return on the fair value of the investment." But what does the pre-attack value of the investment in a railroad have to do with the rates it should charge after a nuclear war? If the railroad's customers have been reduced to a small fraction of their former levels of activity by the war, while the railroad survives relatively intact, there may be no set of rates which would provide a fair return--and the rates which would come closest to doing so may be so high as to exclude many potential customers and leave much of the railroad's capacity standing idle.

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[19] See Clair Wilcox, Public Policies Toward Business (Homewood, Ill.: Richard D Irwin, Inc., 1955), Chapters 18, 19, and 21, for an account of railroad regulation.

On the other hand, if the railroad's customers largely survive, while alternative routes between the cities it serves are destroyed, the demand for the railroad's services may far exceed its capacity. In this case, the "fair return" rates will serve none of their economic function of allocating the services of the railroad among the most urgent uses. Similar comments apply to present methods for regulating the detailed structure of rates--the extension of these methods to post-attack conditions would tend to involve uneconomic discrimination against the movement of precisely the most essential commodities. It is clear, therefore, that drastic changes in the methods by which railroad transportation is allocated among different users would be called for in the aftermath of a nuclear war.

As a final example of possible market failure, consider the problem of planning production over time. Suppose that a steel producer is undertaking the construction of a new plant. When the additional capacity is in operation, there will be more steel available and this may exert downward pressure on steel prices, or at least improve the speed and certainty of delivery. This in turn will tend to expand the opportunities for profitable use of steel, and there should be some adaptation of technique or expansion in steel-using industries as a result. But these adjustments take time, and they should clearly be begun before the additional supply appears on the market. Otherwise, steel capacity may stand idle, or some steel will be diverted for a time to relatively inferior uses. How does the market mechanism assure that the expansion of the steel-using industries will be properly scheduled in relation to the expansion of steel capacity?

In theory, the answer to this question is that there should exist markets in which contracts for the delivery of steel at all future times can be bought and sold. The steel producer can make commitments to sell his additional output at stipulated prices when his new capacity comes into production, and thus assure himself of the existence of the demand that justifies the expansion. Similarly, the steel users will be notified of the intended expansion by the appearance of additional offers in the futures market, plan their own expansion accordingly, and

assure themselves of the reasonableness of the plans by actually buying additional contracts for future delivery. The same practices, extended to all commodities, will in theory provide an efficient scheduling of the development of the entire economy, eliminating in the process the abnormal profits and losses that are the indicators of inefficiency.

In practice, organized futures markets exist only for a few agricultural commodities and metals, and the transactions relate to periods no more than a year in the future. There are many reasons why this is the case, but there are two of central importance: First, a highly developed futures market requires that the characteristics of the commodities involved be closely specified, so that buyers and sellers know what they are dealing in, and that large numbers of buyers and sellers be interested in the same closely specified commodities, so that prices will not vary excessively with the plans of one or two market participants. In reality, however, there are many situations where judgments of quality are highly subjective, or commodities are produced to the detailed specifications of an individual buyer. Second, the gross inefficiencies that could in principle result from the absence of futures markets are in large part avoided as a result of the comparative stability of the economic system and its relatively small deviations from equilibrium. When price relationships remain constant over time, there is no need for an elaborate system of futures prices to reproduce the information provided by the current prices. When price relationships are changing slowly, the range of uncertainty about future prices is small, and so are the benefits conferred by organized futures markets.

In the post-attack economy, price relationships would be radically different from what they are now, and would be subject to equally radical changes over time as recovery efforts went forward. Hence, if the market mechanism were relied upon as an important organizational device, there would be an enormous need for a more comprehensive system of futures markets. Or, in the absence of such markets, other devices would be needed to perform the essential functions of coordinating views about the future course of the economy and reducing the

uncertainties surrounding longer term plans. It is not difficult to think of ways in which the government could both encourage the development of futures markets and provide alternative and supplementary devices. Some of these possibilities will be discussed in Section V.

The illustrations of possible types of market failure in the post-attack situation could be multiplied, and those given above could be treated in much greater theoretical and empirical detail. Hopefully, however, the examples treated here serve to illustrate the fundamental point: References to the gravity of the emergency to be confronted, to the necessity of rational coordination of economic activity, to the values of free enterprise, equity, and humanitarian concern for the unfortunate, contribute very little to the resolution of concrete questions of economic organization. In particular, they say very little about the appropriate or feasible scope for prices, markets, and the pursuit of private economic interests as organizational devices. These devices are employed in some degree in every national economy in the world today, and in many cases their role is much larger than superficial or ideological characterization of the systems would suggest. In considering the problem of economic organization after a nuclear war, it is necessary to confront the specific resource allocation problems involved, the obstacles and opportunities for the use of prices, markets and private incentives, and the specific organizational arrangements that will supplement, limit and control these devices. For this purpose, theoretical welfare economics and the closely related literature on socialist economic planning provide invaluable guidance.[20]

Three Phases of Recovery: The Time Dimension

The partitioning of the problem of economic recovery into its technological and organizational aspects may usefully be supplemented by a partitioning along the

[20] For a discussion of recent developments in the use of prices in Communist economies see Morris Bornstein, "The Soviet Price Reform Discussion," Quarterly Journal of Economics, LXXVIII, 1 (February, 1964), pp. 15-48. Also A. Wakar and J. G. Zieliński, "Socialist Operational Price Systems," American Economic Review, LIII, 1 (Part 1) (March, 1963), pp. 109-127.

time dimension. Many schemes of trans-attack and post-attack time phases have been set forth in the literature o vulnerability and recovery; the one employed here was introduced by the author in an earlier study.[21] The particular definitions chosen for various phases by various investigators are largely a reflection of the particular aspects of the problem that are to be studied. Thus, it is entirely reasonable that an investigator primarily interested in, say, the problem of radiation exposure, sets up a somewhat different scheme of temporal phases than the investigator interested in the division of responsibilities among federal, state, and local governments. The interest here is in the economic problems, and the scheme of phases derives from a very simple characterization of the sequence of economic problems the society would face. It should be noted that in this scheme as in others, the indications of the lengths of the phases are merely suggestive. The specific character of the attack (or attacks) and the extent of preparedness measures would have a great deal to do with the duration of the phases. In addition, the problems characteristic of each phase would be encountered in different regions at different times.

In the survival phase, extending from the time of the attack to perhaps two to four months thereafter, the primary task facing the nation would obviously be to save as many people as possible from the immediate threats to survival. The crucial economic resources in the very early period would be medical services and supplies, firefighting, police and rescue teams, potable water, shelter, communications, and local transportation. Within a week or two, food, electric power, sewage disposal, and intermediate and long distance transportation would be added to the list. New production of material goods would, however, contribute very little to the alleviation of the scarcities. Even on the most optimistic assessment of the possibilities for a rapid recovery of production, the output that could be forthcoming in the space of a few weeks would be negligible relative to the great needs. Furthermore, surviving stocks of many items would be more

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[21] Testimony before the United States House of Representatives, Military Operations Subcommittee of the Committee on Government Operations, Civil Defense--1961, "Economic Recovery From the Effects of Thermonuclear War," 87th Congress, 1st Session, 1961, pp. 303-326.

than adequate for short run needs, while for other items (medical supplies) the adequacy of the stocks would be determined almost exclusively by preparedness programs. The economic problems of the survival period would relate primarily to the production of essential services--including the distribution of food, generation and distribution of electric power, transportation of persons, and the specifically disaster-oriented services of rescue, firefighting, and police.

In the reorganization phase, the central economic problem would be to restore the economy to viability--i.e., to achieve levels of new production adequate to meet the most essential demands without drawing upon inventories. Clearly, the task of getting production of material goods started at all would be a major one. But even a highly efficient utilization of surviving capacity might be inadequate if crucial economic sectors were so badly damaged as to be unable to make their essential contribution to other industries. Thus, the reorganization task would have a technological as well as a strictly organizational aspect. Drastic conversions of surviving capacity might be required to restore a degree of balance to the composition of output, or, if such conversions were infeasible or inadequate, new capacity would have to be constructed. If the necessary adjustments were not made in time, the exhaustion of inventories would plunge the economy into a new crisis of immediate survival--with hopes for dealing with the crisis much diminished by the absence of the inventory cushion.

Assuming the successful achievement of viability, the economy would enter the recuperation phase. The economic problem would be the restoration of levels of output approximating those attained pre-attack. There would be a range of choice as to the rate of recuperation, and, as recuperation proceeded, the considerations bearing on the choice would presumably come to resemble those bearing on economic growth policy at present.

It is helpful also to have a set of terms to distinguish among the various mechanisms of population loss during the war and its aftermath. Primary casualties (or, more narrowly, fatalities) are those directly attributable to weapons effects. Included in this category are both the prompt or direct casualties produced by blast, thermal radiation and initial nuclear radiation, and the delayed or

indirect casualties from fallout and spreading fires. The minimization of primary fatalities depends primarily on the implementation of civil defense measures for which preparations have been made well in advance. Secondary casualties are those attributable in large measure to economic and social damage inflicted by the attack, i. e., to resource shortages and disorganization. The early secondary casualties are those traceable to failures of survival phase activities--inadequacies of water supply, shelter, food distribution, and so forth. The late secondary casualties are those caused by failures in post-attack production, i.e., by failure or near-failure to achieve viability. Of course, the lines between these categories are not entirely clear--shelters with adequate provisions, for example, will not only reduce primary casualties, but will enhance the chances for successfully dealing with survival phase difficulties as well. The categories are, however, sufficiently closely related to obvious distinctions among preparedness measures and post-attack actions to make the classification useful.

III. The Survival Phase

Predictions of the success of efforts to meet the short term threats to population survival after a nuclear war simply cannot be made with any high degree of precision or confidence. Even assuming perfect knowledge of the size and distribution of the attack, there are too many variables with a potentially significant influence on the relationship between the attack effects and the number of survivors two months later. For example, success or failure in attempts at fire control, rescue and evacuation attempts over a large area may depend critically on the details of damage to transportation and communications links, electric power distribution and water supply systems, and on the responses of particular individuals and organizations to the situation. Resources will be committed to the task of meeting the emergency in ways that depend critically on the organizational capabilities and information available to small groups of individuals at particular localities, and the urgency of the situation will preclude all but the crudest consideration of their alternative uses. Thus, the effectiveness with which given surviving resources might be used is extremely difficult to predict.

Inevitably, many actions would be taken that, in retrospect, would be recognized as having been horrendous mistakes. Other actions, of course, might prove to be productive far beyond the expectations of those taking them.

The Analysis of a Range of Possible Situations

It would be possible, however, to define the range of situations that might result from a given attack by making one estimate on the basis of highly optimistic assumptions about the effects of the important variables and another on the basis of highly pessimistic assumptions. Indeed, the usual practice of employing calculations of the primary casualty-producing effects of various attacks for guidance in defense decision-making is reasonable only to the extent that these calculations suggest plausible ranges of outcomes at the end of the survival phase. Estimates of the effectiveness of various survival phase activities and impressions as to the amount of difference that such activities could make are essential to the interpretation of the calculations of primary casualties; the only question is whether the interpretation is explicit and exploits available knowledge or whether it is implicit and perhaps even subconscious on the part of the user of calculations.

The following example, though it is strictly speaking a part of the problem of estimating primary mortalities, illustrates the procedure of comparing optimistic and pessimistic estimates of the consequences of a given attack and suggests the magnitude of the range that may result. Hanunian has estimated the primary fatalities that would result from attacks of various sizes and distributions.[22] He made separate estimates assuming (a) that people would have no more protection from fallout than they would have if they continued their peacetime behavior patterns, and (b) that they would take advantage of basement protection where available. For an attack of 3000 megatons, surface burst and directed against military installations, the difference between these two assumptions amounts to a difference in population survival of about 15 per cent of the pre-attack population.[23]

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[22] Civil Defense--1961, pp. 207-233.

[23] Ibid., Figure NH-5, p. 228. The 15% figure relates to the case in which one-sixth of the attack weight is allocated to missile sites, and represents the approximate difference between the middle points of the two ranges of uncertainty shown.

If a similar procedure were employed in dealing with all the considera tions about which substantial uncertainty exists--including, for example, the processes of fallout deposition, the conditions and rate of firespread, the effectiveness of emergency food distribution--the range between the completely pessimistic estimate and the completely optimistic estimate would undoubtedly be very large indeed. At plausible levels of attack, the range might well amount to a third or more of the pre-attack population. Of course, the absolute differences in population survival will be small at very low levels of attack--when the losses are small even on pessimistic assumptions--and also at overwhelmingly high levels of attack--when survival will be small even on optimistic assumptions.

Systematic quantitative analysis of survival phase activities could serve to make explicit and to narrow the range of uncertainty as to the extent of delayed primary and early secondary mortalities. Such an analysis can most easily and fruitfully be carried out in conjunction with detailed comparisons of alternative civil defense systems, and is in any case beyond the scope of the present paper. The discussion below is limited to a description of the considerations which would define the context of action during the survival phase and some remarks on specific economic aspects of the problem of post-attack civil defense operations.

Attack Variables and Survival

The large uncertainties surrounding any estimate of the effectiveness of survival phase activities after a given hypothetical attack must be viewed in the perspective afforded by a consideration of the plausible range of variation in attack situations. It will be seen that even a highly successful attempt to reduce those uncertainties would not eliminate the necessity for considering a wide range of levels of population survival.

The crucial variables describing an attack include the total delivered megatonnage, the size distribution of weapons, the targeting (whether against strategic retaliatory forces, military installations in general, or population and industrial targets), the height of burst (whether surface, air or high altitude), the weather, the time of day and season of the year. In addition, of course, the availability of shelter and the amount of warning have a great deal to do with population survival.

Depending on the circumstances of war outbreak and the forces and strategies of the combatants, almost any combination of these factors may occur, and the resulting range of outcomes in terms of blast, prompt radiation and fallout casualties is very large. For example, in the Hanunian analysis cited earlier, it is estimated that an attack weight of 3000 megatons directed against military installations would produce 5 per cent fatalities in the population if available basements were used for fallout protection, and the attacker used air bursts except against hard targets. The same weight of attack would produce roughly 60 per cent fatalities if opportunities for shelter were not exploited, and weapons were surface burst. If the attack were directed against cities per se, it could produce 80 to 90 per cent fatalities in a completely unprepared population.[24] It should be noted that 3000 megatons is toward the lower end of the plausible range of attack weights on the basis of unclassified estimates of Soviet delivery capabilities.[25]

While a quantitative discussion of all the various combinations would be extremely voluminous, it may be useful to summarize here the relevance of the most important variables considered separately.

Attack Weight. The general implication of increased attack weight is obvious. However, it is worth noting the less than proportional relationship between the weight of attack and the extent of damage to any given target system. This follows from the assumption that the most "lucrative" targets from the point of view of the attacker will be attacked at low levels of attack; as the target list expands the added targets are necessarily less lucrative. Thus, if population is the target, an

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[24] Ibid., Figure NH-5, p. 228, and Figure NH-3, p. 216. The first two cases compared relate to the case in which one-sixth of the attack against military installations is allocated to missile sites.

[25] See, e. g., the table presented in Betty Goetz Lall, "Substantial Reductions in Strategic Delivery Vehicles," Bulletin of the Atomic Scientists, XXI, 1 (January, 1965), p. 47. As to the plausibility of this weight of attack being directed against cities, however, see below, p.

attack of 100 megatons (airburst, 10-megaton weapons) would kill roughly 12 per cent of the U.S. population in the absence of shelters; 200 megatons would kill 18 per cent, 300 megatons 22 per cent, 1000 megatons 37 per cent.[26]

Weapon Yield. The distance to which a given level of blast effect extends varies as the cube root of the weapon yield; hence, the area covered by at least a given level of blast effect varies as the 2/3 power of the yield. For example, a 10-megaton bomb produces at least light damage over an area 100 times as large as a 10-kiloton bomb. Hence, a given total weight of attack will produce more damage if individual weapons yields are small than if they are large. Other phenomena are involved in thermal effects; the distance to which fine fuels will be ignited increases somewhat more rapidly with yield than the blast effect.[27]

Fission Fraction. The residual nuclear radiation produced by a nuclear explosion is primarily accounted for by the radioactive elements produced by the fissioning of weapon material. The larger the fraction of the total energy yield that is due to fission, the more residual radiation there will be. In thermonuclear weapons, the fission fraction averages about 50 per cent.

Height of Burst. A surface burst results in local fallout. Material from the earth's surface is drawn up into the radioactive cloud, becomes contaminated with radioactive fission products, and falls back to earth within 24 hours, producing radiation levels on the earth's surface that are potentially lethal. A surface burst also maximizes the distance to which ground shock and the higher overpressures extend, and is therefore likely to be employed to produce damage on "hard"

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[26] These figures are derived from Table 14, p. 209, in Sidney G. Winter, Jr., Economic Viability After Thermonuclear War: The Limits of Feasible Production (Santa Monica, Calif.: The RAND Corporation, RM-3436, September, 1963) (Cited hereafter as Economic Viability. . . .).

[27] For a discussion of thermal effects, see Report of Panel on Future Weapon Effects, Project Harbor (Washington, D.C.: National Academy of Sciences--National Research Council, 1963), pp. 13-28.

targets. An air burst (i.e., one in which the fireball does not touch the ground) produces no local fallout of importance, but the distances to which low blast overpressures and thermal radiations extend are increased. A high altitude burst (altitude in excess of 100,000 feet but less than 250,000 feet), will have markedly reduced blast effects, but the ignition radius for fine fuels may be very large (for a 100-megaton weapon, the ignition radius in average clear weather is about 55 miles).[28] In general, the distances at which ignition of fine fuels will occur for an air burst are roughly the same as those at which moderate plaster damage will occur.

Target System. U.S. missile sites are located primarily in the Midwest and Rocky Mountain areas, and thus are fairly well separated from the areas of main population concentration. Other important military installations are distributed fairly uniformly over the nation. Other things equal, therefore, an attack will produce far fewer fatalities if it is directed against military installations than if it is directed against cities, and the more so if it is directed primarily at missile sites. Since industrial activity is much more concentrated in cities than the population, and industrial plants are not damaged by fallout, an attack against cities will result in much lower levels of surviving capacity per capita than an attack against military installations, and the more so if the attack against military installations involves surface bursts and consequent fallout casualties. Since in any given category of industrial capacity there are bound to be some plants that are located in areas of low population density, an attack designed to produce a "bottleneck" in a given type of capacity will generally cause significantly lower population losses than an attack directed at population.

Although nuclear strategy as such is not within the scope of this essay, there is one strategic consideration that has such important implications for the plausibility of various attack weight and target system combinations that it cannot be ignored. This is the fact that a nation involved in or initiating a nuclear war is rather unlikely to possess simultaneously abundant means and abundant incentive for striking at the population of the enemy. The means would be available if the

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[28] Ibid., p. 26.

nation were initiating the nuclear exchange and had the time to carry out a carefully planned attack--but in this instance the attack would presumably be directed primarily at the enemy's strategic forces. To divert a substantial weight of attack to cities could only serve to increase the size of the retaliatory blow and the threat to the attacker's survival. On the other hand, the incentive to strike at cities might exist for a nation that had suffered the first blow, since there might be few attractive military targets to strike at, and both the revenge and coercive aspects of a city strike might seem attractive. But in this case, the attack would presumably be mounted with a damaged, uncoordinated and perhaps inefficiently targeted strategic force. The possible elaborations and qualifications of this line of argument are numerous and complex, and it certainly does not completely exclude the possiblity of enormous attacks against cities.[29] It does, however, indicate the existence of a range of possible situations in which the damage to cities would be much less than a crude consideration of force sizes might suggest.

Weather. Clear, dry weather tends to increase the radius of ignition of fine fuels both by extending the distances to which given levels of thermal effects extend and by reducing the thermal exposure required to ignite the fuels. Conversely, cloudy, wet weather sharply limits thermal effects and brings the limits of such effects well within the area of blast damage. Heavy cloud reduces the radius of ignition by a factor of two or more relative to the results in clear weather. High humidity is known to reduce sharply the probability that a large number of point ignitions will merge into a mass fire. High winds are favorable to the development of a moving mass fire, while calm conditions are more favorable to the development of a firestorm--a fire confined within its perimeter of ignition by the radial winds generated by the fire itself. High temperatures and high humidity will make mass fallout shelters uninhabitable in a short period unless special provisions for ventilation are made.

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[29] See e.g., Herman Kahn, op. cit., Chapter 2.

Time of Day. During working hours, urban populations are especially vulnerable to direct attack, both because of the greater concentration of the population and because of the likelihood that warning of the attack would merely produce chaotic traffic jams as people attempted to rejoin their families. On the other hand, downtown buildings provide more fallout protection than houses, and in the absence of direct attack the concentration of population in the downtown area would be desirable.

Season. In addition to the obvious relationship with the weather considerations noted above, the season of the year would affect survival by affecting, for example, the death rate from exposure among persons made homeless by the attack. Also, disruption of heating fuel supplies would be of little consequence in the summer, but could have serious implications in the wintertime. The time of year also has direct implications for the size, location and composition of food stocks, and the ease of repairing damaged utilities and transportation links.

Shelter and Warning. Although a distinction is commonly made between fallout shelters and blast shelters, there is no sharp distinction in fact. Few if any of the shelters referred to as blast shelters will actually withstand a direct hit by a thermonuclear weapon; on the other hand, at the right distance from the explosion, almost any sort of protection can mean the difference between life and death. This point is of great importance because the area covered by blast and thermal effects lethal to the completely exposed but relatively harmless to the lightly sheltered is very large. At Hiroshima and Nagasaki, survival rates to the 4 to 6 psi overpressure region were zero for the completely exposed and 95 per cent for those in concrete buildings.[30] If it is assumed (incorrectly) that no one survived in the over 6 psi region, and everyone survived in the less than 4 psi region, then the importance of the shelter afforded by concrete buildings can be

[30] See Carl F. Miller, "Nature and Purpose of Radiological Countermeasures," Appendix A in Report of Panel on Postattack Recovery Program, Project Harbor (Washington, D. C.: National Academy of Sciences--National Research Council, 1964), pp. 61-62.

described as follows: For a 10-megaton weapon (air burst), sheltering in concrete buildings will reduce the area of lethality from blast and thermal effects by over 40 per cent. (This calculation does not take into account the substantial fire danger in this region, but the Hiroshima and Nagasaki survival rates reflect the effects of the fires in those cities.) Thus, even a small amount of warning can have very important effects on over-all survival rates, provided that it is properly exploited.

Circumstances of War Outbreak. The reference here is to the sequence of military and political events leading up to the war. If the nuclear war were to develop out of an extended period of extreme tension associated with large-scale conventional warfare, it is reasonable to assume that substantial improvements would have been made in civil defense capabilities. However, the resource demands of conventional warfare, shelter building and perhaps additions to strategic forces and active defenses might well have precluded adequate provision for economic recovery in the event of nuclear war. Indeed, inventories might be substantially below normal. Hence, a nuclear war in this context might result in relatively high levels of immediate survival associated with subnormal inventories, and this would tend to call into question the sharp distinction between the survival phase and the reorganization phase--there might not be a temporary, inventory-supported respite from immediate threats to survival. By contrast, a nuclear attack "out of the blue" would impinge on a society both affluent and unprepared, and temporary support of the diminished number of survivors would be more feasible.

The Balance between Population and Resources. It is reasonable to assume that, given the number of immediate survivors, the possibilities for meeting both short and long term threats to their continued survival will depend on the general adequacy of other economic resources. On that assumption, the possibilities will be greater if the attack is small and the population poorly sheltered than if the attack is large and population well sheltered, if the fatalities are largely due to fallout rather than blast and thermal effects, if the attack is on military installations rather than cities, if the attack is "out of the blue" rather than preceded by extended tension or hostilities, and greater if the attack is in the daytime rather than at night. Note

level of immediate survival. The prospects would presumably be less favorable at lower levels of immediate survival, so that the net effects of changes which lower immediate survival but increase resource survival relative to population survival are difficult to assess. In general, it is to be expected that the balance between population and resources will be crucial when population survival is high, but improvements in the balance do not offset additional population losses when population survival is already low.

The Resource Base of Survival Activities

Assuming that the nuclear attack is not preceded by a prolonged period of extreme economic effort, and assuming that the weight of attack on population and industrial targets does not exceed 2000 megatons, there is likely to be a very definite pattern in the post-attack balance of supplies and essential needs for material goods. In one category are the goods for which the essential requirements per capita are roughly the same post-attack as pre-attack. For these goods--food, housing, clothing, consumer durables, etc.--surviving stocks should be more than adequate to meet the most essential needs in the first two months, although distribution problems may be critical. The other category consists of goods required for "repair and patchup" both of facilities and of human beings--medical supplies and drugs, bulldozers, wire and cable, sewer pipe, hand tools, nails, bolts, etc. For these, needs will have increased enormously, and the requirements will dwarf the supplies unless stockpiling measures are taken pre-attack. Obviously, the supply-requirements balance may differ widely within the two categories, depending, for example, on the locations of the stocks relative to the target areas and on the storability of the goods. The general pattern referred to will certainly dominate the over-all picture.

Food. Consider first the food situation. Repeated studies have shown that surviving good stocks should be adequate, at least in calorie content, to support the

surviving population for well over one year without any new production whatsoever.[31] Depending on the time of year and the level of population survival, food supplies would probably be adequate for two years, and might well last even longer. Average levels of wheat and corn stocks (primarily government surplus) would provide 3000 calories per person per day for the entire population for something over a year and a half.[32] Stocks in homes, retail and wholesale outlets, food manufacturers' inventories and surplus stocks of other commodities would be available to provide a more palatable diet and would extend the total period to over two years.[33] If livestock herds were greatly depleted by the attack, much greater reliance could be placed on chickens as a source of protein. Chickens have numerous advantages as an emergency protein supply after nuclear war; they are the most radiation-resistant of the commonly eaten domestic animals, they are extremely efficient converters of grain into protein, and flocks can be expanded rapidly.[34] For plausible distributions of the attack, population losses generally exceed in percentage terms the destruction of food stocks; hence calculations in terms of the total population and present levels of stocks tend to understate the period for which food supplies would last.

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[31] See, e.g., Paul D. Marr, Food Supply and Production Following a Massive Nuclear Attack (Menlo Park, Calif.: Stanford Research Institute, October, 1958); Economic Viability..., pp. 115-119.

[32] The figure given in Economic Viability..., is 2 1/4 years. The decline reflects the increase in population and, more importantly, the decline in stocks of wheat and corn since the calculations in Economic Viability... were made. The figure of something over 1 1/2 years is based on the average 1963 stocks reported in Survey of Current Business, 1964, 12 (December, 1964), pp. S-27 and S-28.

[33] See the testimony of former Assistant Secretary of Defense (Civil Defense) Steuart L. Pittman in United States House of Representatives, Hearings before Subcommittee No. 3 of the Committee on Armed Services, Civil Defense--Fallout Shelter Program, 88th Congress, 1st Session, 1963, Part II (Vol. 2), p. 5156.

[34] See Report of Panel on Postattack Recovery Program, op. cit., Appendix D, p. 133.

Heating Fuel. Consider next the problem of fuel for heating. If the attack came in the winter months, considerable hardship would clearly result from the disruption of supplies of gas, fuel oil and coal for heating. Unfortunately, no systematic study appears to have been made of the essentiality of these demands (in terms of the consequences for the health of the population) or of the possibilities for economizing on the use of fuel. An illustrative indication of the supply situation in the case of distillate fuel oil may be obtained as follows: at worst, normal stocks at the end of a given month will cover something over 80 per cent of the normal consumption of the succeeding two months.[35] The Stanford Research Institute study of the post-attack petroleum industry (in which the demand for fuel for heating was disregarded as inessential) indicates that, at worst, surviving stocks per capita would not be less than 60 per cent of normal.[36] Hence, at worst, surviving stocks would permit per capita consumption at roughly 50 per cent of normal for a period of two months. (About 60 per cent of normal consumption is accounted for by space heating and cooking, the remainder is accounted for by roads, vessels, manufacturing, and other uses.) In view of the heating economies that would be associated with increased housing density, a thorough investigation of the problem would probably reveal that no serious hardship would result from a shortage of heating fuels at any time during the first post-attack year.

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[35] Based on figures for end of month stocks and domestic demand presented, Survey of Current Business, 1964, 12 (December, 1964), pp. S-35 and S-36.

[36] This is an over-all judgment based on the results for four of the attacks considered by Sanford B. Thayer and Willis W. Shaner, The Effects of Nuclear Attacks on the Petroleum Industry (Menlo Park, Calif.: Stanford Research Institute, July, 1960). A fifth attack was considered in which crude oil refineries were singled out as a target system; this would result in much lower levels of surviving stocks per capita than considered here. The population survival figures for the various attacks are not presented in the report cited, but may be found in another study: see O. E. Williamson and K. D. Moll, Postattack Farm Problems, Part II, (Menlo Park, Calif.: Stanford Research Institute, October, 1961), p. 197. It is assumed that the population would take advantage of available fallout protection.

Consumer Durables and Housing. The per capita supplies of housing, furniture, bedding, clothing, cooking utensils and other consumer durables and semidurables are so large in the United States today that a reduction to a half or a third of present levels would still leave this country well off in comparison with most of the world. If it is assumed that stocks of these items are geographically distributed in proportion to the population, then an impression can be obtained of the levels of attack on population targets that would produce reductions of this magnitude. Only about 250 one-megaton weapons, properly placed, would be required to produce at least light blast damage (and corresponding fire danger) to one-half of the nation's housing.[37] Roughly 600 one-megaton weapons would produce such damage to two-thirds of the housing.[38] Thus, if 100 per cent population survival could somehow be assured, relatively low levels of attack on urban areas would make significant increases in housing densities necessary. Even allowing for larger individual weapons, less than perfectly accurate delivery, and imperfections in targeting, the attack required to damage half the nation's housing is probably not much over 1000 megatons.

If, however, shelter programs were adequate to assure very high levels of population survival in spite of heavy attacks on urban centers, the shelters themselves would provide an adequate supply of emergency housing and would presumably be stocked to some extent with other essential items. It is more relevant to evaluate the housing situation under less optimistic assumptions about population survival. If the entire population had protection equivalent to that provided by ordinary basements, it appears that the proportion of housing rendered uninhabitable by large

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[37] This is based on the population distribution by 20 km square target areas presented in Economic Viability... , Table 14, p. 209. A one megaton weapon air burst at the center of such a target area would produce peak overpressures on the order of 2 to 3 psi at its edges; moderate damage to a wood-frame house (interior partitions blown down) occurs at about 2.7 psi, light damage at 1.0 psi: see Samuel Glasstone (ed.), The Effects of Nuclear Weapons, (rev. ed.), (Washington, D. C.: U. S. Government Printing Office, 1962), pp. 161, 200-216, 637-640.

[38] This is the same sort of calculation as the preceding one, but is based on data not presented in Economic Viability... .

attacks on population centers would not exceed the proportion of population losses by more than a factor of 1.5.[39] On this assumption, an attack which kills half the population destroys 75 per cent of the housing and increases the over-all housing density by a factor of two, while an attack that killed 57 per cent would increase it by a factor of three. The weights of attack on cities that would inflict these levels of population losses are approximately 1000-1400 (one-megaton weapons) or 1500-2500 megatons (10-megaton weapons).[40] Of course, attacks directed entirely or in part against military installations would, if the weapons were surface burst, involve a much lower level of housing destruction relative to population losses.

Enormous difficulties would undoubtedly be encountered in the attempt to achieve a fairly even distribution of housing space, clothing, etc. among the survivors.[41] The rough calculations presented above should not be interpreted as meaning that there would be no need for large-scale construction of emergency housing units, or that quick resumption of production of clothing, bedding, and so forth would be unnecessary. Rather, they are intended to make the point that, so far as housing services and supplies of most durable and semidurable goods are concerned, the problem during the survival phase would not be one of over-all inadequacy but of maldistribution--provided that the level of attack on cities is less than about 2000 megatons and high quality shelter systems are not installed. Whether preparedness programs should emphasize measures to overcome the post-attack maldistribution or programs of stockpiling and post-attack production is a

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[39] This is a very rough estimate, and acutal situations could deviate from this factor in either direction by substantial amounts. Much would depend on the extent and rate of fire development in damaged areas (itself dependent on the weather, among other things, and on the effectiveness of rescue operations). The factor could be 1.0 or less if the population were unwarned, it could be 2.0 or more if the population had the blast protection associated with specially constructed fallout shelters rather than basements.

[40] Based on Hanunian, op. cit., Figure NH-2, p. 213, after allowance for fallout deaths.

[41] For a discussion of the relations among housing destruction, casualties, evacuation, emergency billeting, and so forth under World War II bombing attacks see F. C. Iklé, The Social Impact of Bomb Destruction (Norman, Okla.: The University of Oklahoma Press, 1958), Chapters 3 and 4.

that these assertions are made for a given question that would require much more detailed analysis. Furthermore, it should be reiterated that there is a category of goods required for repair and patchup, and for these goods the surviving stocks would, in the absence of deliberate stockpiling, almost certainly fall far short of obvious needs.

Services. The critical economic problems during the survival phase would relate not to the production of material goods but to the production of services. Leaving aside the specifically disaster-oriented and obviously important services of fire-fighting, emergency medical care, rescue, etc., there remains a large category of services in which a very rapid restoration of a minimal level of production is essential if large numbers of secondary casualties are to be avoided. Some of these, such as food distribution, gas and water supply, and sanitation systems, have a direct relation to such threats to survival as starvation, thirst and disease. Others, such as electric power, transportation and communications provide essential inputs to the services in the first category and in general make possible the effective utilization of other material resources.

The expectation that shortages of these services would be severe is not based on an assessment of the physical vulnerability of the productive plant and equipment involved. On the contrary, the vulnerability to weapons effects is relatively low and the locations of the resources in relation to potential target areas are comparatively favorable. For example, water treatment plants, sewage disposal facilities and electric generating stations are typically located on the fringes rather than near the centers of urban areas. Water mains are protected by virtue of being underground. Although power distribution systems are vulnerable, they are likely to require only minor repairs in areas in which frame houses are inhabitable. Railroad rolling stock will survive and remain usable at blast overpressures which would cause moderate to heavy damage to residences. Although damage to gas distribution systems poses a significant fire threat, ignitions from this source are likely only in areas of severe blast damage. Thus, in general, the physical components of these various systems are if anything somewhat less

vulnerable than residential buildings, and somewhat better situated in reference to target areas.[42]

The potential problems arise from three considerations. First, even a disruption of production of some of these services for a period of a few days may have severe consequences--as in the case of water for firefighting and drinking, or power for emergency communications and shelter ventilation systems. Second, the "network" character of the systems implies that a very small amount of damage may render the system inoperative over a wide area--as when water pressure fails because of a small number of leaks in the mains, electric power fails because a high voltage transmission line is knocked down, or rail transportation between two points is unavailable because a single bridge has been destroyed. Third, both repair efforts and operation of undamaged portions of the systems in the immediate post-attack period might be seriously hampered or rendered impossible by the radiation hazard to operating personnel.

It would be extremely difficult to deal with these problems by improvisation after the attack. The sheer magnitude of the requirements for minor repairs to power, transportation and communications systems would be overwhelming in relation to normal stocks of parts and normal supplies of skilled manpower, even though the individual tasks might be quite routine. Ordinary water treatment methods remove at least the insoluble portion of fallout material from the water and probably reduce contamination to a level safe enough for drinking under emergency conditions--but the very process of removing this material creates a radiation hazard in the treatment plant above and beyond the general fallout problem.[43] Coal

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[42] The vulnerability of the resources involved in these various systems is discussed in The Effects of Nuclear Weapons, op. cit., especially pp. 245-273. See also Economic Viability..., pp. 119-121 (on water) and pp. 142-151; H. L. Dixon, D. G. Haney and P. S. Jones, A System Analysis of the Effects of Nuclear Attack on Railroad Transportation in the Continental United States (Menlo Park, Calif.: Stanford Research Institute, April, 1960); and, on World War II experience, F. C. Iklé, op. cit., Chapters 5 and 6.

[43] Report of Panel on Postattack Recovery Program, op. cit., pp. 127-129.

burning electric generating stations would not be hampered during the survival phase for want of coal, since most of them maintain coal supplies adequate for two months or more of normal operation--but during the period of high radiation levels it would be very difficult to get the coal into the plant without excessive exposure to the workers. Where problems like these could not be reduced to manageable proportions by preparedness programs, civil defense planning would have to face the high probability of disruption of these services.

The record of restoration of utilities, provision of emergency food distribution, and repair of damage to transportation systems after natural disasters and World War II bombing attacks testifies both to the urgency of these services and to the effectiveness with which emergencies can be handled. Water service was never completely interrupted in Hiroshima, while in Nagasaki there was partial restoration of service within 24 hours. In both cases, breakage of water pipes at entrances to buildings, and consequent loss of pressure, were the chief problems.[44] After the Alaskan earthquake of Good Friday, 1964, telephone and electric power service was restored in most areas on the following day. Water supply was restored by segments as ruptured mains were repaired.[45] The Alaskan experience was consistent with the generally high level of effectiveness which public utilities corporations have displayed in coping with natural disasters in the United States, even when the necessary tasks involved substantial risk to personnel.[46] Through traffic was restored on the rail lines through Hamburg only a few days after the great raids had destroyed half of that city's housing.[47] A remarkable example of effectiveness in emergency food distribution is the case of Nagasaki, where organized mass feeding

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[44]Report of Panel on Postattack Recovery Program, op. cit., p. 37. See also The Effects of Nuclear Weapons, op. cit., pp. 264-266.

[45]Department of Defense, Office of Civil Defense, Office of the Secretary of the Army, The Alaskan Earthquake (Washington, D. C.: U.S. Department of Defense, May, 1964), pp., 4, 6, and 10.

[46]See Allen H. Barton, "The Emergency Social System," in G. W. Baker and D. W. Chapman (eds.), Man and Society in Disaster (New York: Basic Books, Inc., 1962), pp. 243-244.

[47]F. C. Iklé, op. cit., p. 188.

provided an estimated 75,000 dinners on the day the explosion took place.[48] Of course, in relating these historical examples of relatively prompt restoration of essential services to the post-attack situation, the unprecedented factor of fallout radiation must be kept in mind. Whether even the most ambitious preparedness programs would make possible a comparable degree of effectiveness in these areas is highly problematical.

Some Organizational Aspects of Survival Phase Activities

The foregoing survey of the resource base of survival phase activities bears out the general characterization of that period offered in Part I: even in the absence of stockpiles of the comparatively narrow category of "repair and patchup" items, the material requisites for an enormous amount of emergency action would exist--over a wide range of attack levels. This conclusion applies not only to such items as food and fuel, but also to most of the plant and equipment inputs to essential services. The remaining discussion in this section deals with the problem of making effective use of those resources, emphasizing the economic aspects in contrast to those of civil defense techniques, training and organization.

Control over Stocks of Essentials. Economic organization in the immediate aftermath of a nuclear attack would be directed first of all to preventing the dissipation of essential stocks of finished goods. The possibility of extreme scarcity of necessities would be apparent to everyone, and, in the absence of clear and effective measures to assure equitable distribution, it would be only reasonable for individuals to attempt to build up large hoards. Once such hoards were established--distributed among the population on the basis of ready access to cash and other more fortuitous circumstances--it would be extremely difficult to identify them and retrieve them for equitable distribution. In some circumstances, inadequate organizational arrangements might result not merely in

[48] Ibid., p. 147.

maldistribution but in outright physical loss of some stocks. For example, preservation of the meat from livestock exposed to fatal radiation levels would probably require emergency arrangements among farmers, meat packers, and civil defense authorities.

The establishment of effective control over essential stocks would require organization at all levels of government. First, normal distribution methods at the local level would have to be suspended immediately in favor of some form of rationing in accordance with emergency consumption standards. Federal and state authorities would have to take measures to assess, control and protect stocks of essential commodities at the wholesale level, in transit, and, of course, in government stockpiles of food and other commodities. The protection of the larger stocks from loss through theft, or through spoilage, leakage or contamination brought about by minor damage, would in itself be a problem of considerable magnitude--especially in view of the hampering effects of fallout and the urgency of other tasks. Plans for carrying out these functions have been under development for some time, especially at the Federal level, and there is no need to discuss here the details of the division of responsibilities.[49]

Several elements would be crucial to the success of plans for establishing control of essential stocks. First, the enormously wide range of possible situations in terms of the impact of the war on Federal, state, and local agencies must be confronted. A single division of responsibilities among geographically distributed organizational units could hardly be expected to be properly related to surviving capabilities after an actual attack. Planning must provide for an orderly succession of responsibility for at least those major tasks which have wide geographical significance--just as it must provide for an orderly succession to the Presidency and to state governorships. Otherwise, some essential tasks will

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[49] The National Plan for Emergency Preparedness (Washington, D. C.: U. S. Government Printing Office, December, 1964), especially Chapters 8 and 13. The executive orders assigning emergency functions to Federal agencies are collected in Executive Orders Prescribing Emergency Preparedness Responsibilities of the Federal Government (Washington, D. C.: Office of Emergency Planning, 1963).

be left undone because the responsible authorities have been killed and their offices destroyed, while in other cases organizational capabilities will be dissipated in disputes about the division of responsibilities. In view of the uncertain availability of communications, the problem of prescribing rules by which a given individual can determine whether particular responsibilities have fallen upon him is not an easy one. However, it seems clear that the key to this problem is to make the division of responsibilities both clear and comprehensive at the level of local governments, military commands, and local offices of federal and state agencies. All major tasks should be assigned to local organizational units with capabilities on the scene; such units should not require extensive guidance from higher authorities, but should of course be prepared to accept it if the relevant higher headquarters is functioning.

Second, there must be pre-established, orderly, and authoritative procedures for overriding the ordinary processes of the private economy. For example, a temporary "freeze" on food sales, followed by arrangements for compulsory distribution and perhaps requisitioning will be called for. To minimize enforcement problems and social strains, there should be at least formal observance of the constitutional requirement for just compensation for private property thus appropriated for public use.[50] Pre-attack values would be both the most appropriate and the most practical basis for such compensation arrangements, and for this reason a temporary general price freeze at pre-attack levels would be desirable. Such a price freeze might also confer the incidental benefit of inhibiting an immediate and general loss of confidence in the value of money, and, if so, would help to contain the pressures for building up private hoards. It goes without saying that the real meaning of any formal "compensation" would depend on prices and the availability of goods when the payments were made. To make "just" compensation possible, it would be desirable to defer the actual settlement of compensation claims until the compensation problem could be treated as a apart of the more general problem of equalization of war losses and restoration of property rights.

[50] See William K. Chipman, Nonmilitary Defense for the United States: Strategic, Operational, Legal and Constitutional Aspects (Madison, Wisc.: National Security Studies Group of the University of Wisconsin, May, 1961), pp. 335-366, for a discussion of the legal aspects of the proposals made here and below.

Third, the establishment of effective governmental control over essential stocks must not be inhibited by uncertainties as to the actual ownership of the stocks. As with the payment of compensation, the guiding principle must be to meet the emergency promptly and to defer the whole problem of property rights and loss equalization until later. To the extent, therefore, that circumstances permit something other than the outright commandeering of property that is of dubious ownership, or is owned by persons dead, missing, or simply absent, the appropriate procedures would simply involve making records of the type and location of the property taken and any available indications as to its probable ownership. Stocks of essential commodities in transit to distant points, or in businesses or homes whose owners or occupants were dead or inaccessible, would have to be dealt with in this way.

Procedures for Equitable Distribution of Essential Stocks. The institution of procedures for achieving an equitable distribution of food and other necessities should go forward at the local level more or less contemporaneously with the task of inventorying and establishing official control over the stocks. Rations should be set at quite austere levels in the early stages, pending further clarification of the local, regional, and national resource picture. In localities receiving refugees from areas of blast and fire damage, severe shortages would appear at a fairly early stage; with the passage of time the need for re-allocations of supplies over large geographical areas would become more pronounced. This would present organizational problems rather different from those of preventing the disappearance of locally available supplies into private hoards.

In natural disasters in advanced economies, a very short time elapses before the stricken area receives a flood of voluntarily contributed supplies for the surrounding territory. Indeed, the outpouring of aid from the surrounding "cornucopia society" often overshoots the optimum and places additional burdens on the organizations attempting to cope with the disaster.[51] As has been widely remarked, it is not easy to extrapolate this characteristic feature of peacetime disasters to the

[51] See Allen H. Barton, op. cit., pp. 258-259.

situation that would prevail after a nuclear war. In terms of relative degrees of need, the areas touched only by fallout or not at all would still represent a potential "cornucopia" of essential supplies for areas that suffered blast damage or were receiving refugees from such areas. But the relatively fortunate areas would, for the most part, have suffered a large disaster in absolute terms, and people in these areas might well expect to be among the recipients of aid rather than the donors. Furthermore, they would certainly be aware that their present affluence in surviving stocks of necessities could prove to be temporary, and that the future might bring severe deprivation. Finally, the general magnitude and scope of the disaster, plus the special problem of fallout, would undoubtedly make it impossible to produce a large flow of aid from the more fortunate areas for a substantial period of time--and with the passage of time, disaster research suggests, there is likely to be a waning of sympathetic concern for the less fortunate.

The problem posed by the absence of a generous flow of voluntary aid from the more to the less fortunate areas would be most severe in the case of items like clothing, blankets, hand tools, cooking utensils, etc. For these durable and semi-durable items, stocks in stores and warehouses are likely to account for a relatively small fraction of the total "surplus" held by the more fortunate area. A substantial redistribution toward the areas of greatest need would therefore require that supplies be retrieved from private individuals, a process which is likely to be difficult and inefficient unless it is largely voluntary. Careful consideration should therefore be given to the problem of designing a combination of appeals, inducements, and threats that would be of maximum effectiveness in bringing forth the needed supplies. Some form of compensation for contributions made would probably be a part of the ideal combination.

The problem of adjusting the distribution of housing space among the survivors would arise in a severe form early in the survival period and would probably continue to exist, in a less severe form, well into the reorganization phase. In the earlier stages, the adjustment would certainly require billeting the homeless in private homes of others, as well as the provision of shelter on an emergency basis in hotels and motels, educational institutions, and so forth. With the passage of time, these emergency arrangements would be gradually replaced by construction

of emergency housing units, conversion of non-dwelling structures, and the subdivision of existing dwelling units. It seems likely that a fairly substantial long term relocation of population in the less damaged areas would be required, with attendant increases in housing densities. An important organization problem will be to make the necessary adjustments in the housing supply with a minimum expenditure of resources on alterations, conversions, and new construction.

A final organizational aspect of the problem of controlling and redistributing essential stocks concerns the relationships among Federal, state, and local authorities. To the extent that local and state officials consider themselves to be responsible primarily for the welfare of the citizens of their own political subdivisions, redistributions that are urgently needed in a national perspective may be in sharp conflict with the inclinations of particular state and local officials. While it is difficult to assess the probability that state and local officials would refuse to comply with, or hamper the implementation of, Federal directives removing urgently needed supplies from their control, it would be unwise to assume in pre-attack planning that the probability is precisely zero.[52] Preparedness planning should seek to minimize this probability; in particular, it should not be predicated on a prolonged total incapacitation of the Federal Government. Whatever else is lost, the Federal Government must be prepared to retain two essential bulwarks to its authority: (1) an information and communications system capable of providing a basis for realistic decisions and communicating the decisions when made,[53] and (2) active control of all military units involved in civil defense activities, including National Guard units.

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[52] See the remarks of Robert McGinnis on this point in "Postattack Restoration of American Society," Appendix H in Report of Panel on Postattack Recovery Program, op. cit., pp. 183-184.

[53] For a discussion of the role of damage assessment systems in providing the necessary information base, see B. F. Massell and S. G. Winter, Jr., Postattack Damage Assessment: A Conceptual Analysis (Santa Monica, Calif.: The RAND Corporation, RM-2844-PR, November, 1961).

Operation of Essential Services. While it is conceivable that the organizational arrangements needed to achieve control over essential stocks might be improvised after an attack, at least at the local level, the problems of sustaining the operation of basic utilities (including transportation and communications) would be much less likely to yield to such improvisation. As was noted above, the problem of protecting essential personnel and making continued operation possible under fallout conditions should either be solved by suitable preparations, or else preparedness planning in general should reflect the incompleteness or absence of the solution. Whatever the technological limit on the post-attack operation of utilities, there would remain the organizational problem of assuring maximum production within those limits. The foremost requirement is to assure that operating personnel are either on the job or in shelters in or very near the place of work. Since studies of disasters have repeatedly underlined the very strong pull of family attachments on persons involved in disaster, and the rather high probability that persons with important emergency functions will desert their posts in order to rejoin and protect their families, the only reasonable solution would seem to be one in which family attachments and the emergency role pull in the same direction. This might be accomplished, for example, by programs which would make high quality shelter space available to utilities workers and their families at the place of work. If separated when warning was received, families would reunite at these shelters. As a supplement to these arrangements, and to guard against a possible reaction by the general public against the "favoritism" shown to utilities workers, plans could be made for the automatic creation of a paramilitary organization of utilities workers, in the event of a nuclear attack. Such a form of organization might prove valuable in carrying out hazardous tasks, in the early post-attack time period, such as the repair and patchup of transmission lines, water distribution systems, and so forth.

Success in maintaining or quickly resuming the production of essential services during the survival phase will also depend on the availability of fuel, repair parts and other essential materials. Here, as in the case of the distribution of consumer goods, normal market processes would be ineffective and would have to be

overridden by administrative fiat. The relevant stocks would come under government control and would be allocated in accordance with criteria of urgency. And, as in the case of consumer goods, the problem of compensation for the private property acquired should be deferred, but the information necessary to a determination of appropriate compensation should, if possible, be recorded.

The organizational devices suggested here for basic utilities could be applied more widely to the operation of other sectors of the economy during the period of warning, the attack, and the survival phase. Three objectives would be paramount in these other sectors. First, damage should be held to a minimum, and productive resources preserved. In particular, some industries (petroleum, steel) should be prepared to accomplish an orderly shutdown, with minimum damage to facilities. For this purpose, the plan of providing shelter for essential workers and their families at the place of work might be effective. Second, while new production of survival items is unlikely to be of major importance, it is nevertheless true that such production should be maximized. Thus, plants producing basic foodstuffs, medical supplies, hand tools, etc., should produce as much as the availability of inputs would permit. Organizational arrangements should assure that production in such plants would be at the technological limits, regardless of the ownership of the necessary inputs. In plants where a rapid conversion to production of obviously scarce items would be possible, plans to make such conversions should be triggered automatically by the occurrence of the attack. Third, production should be halted and input inventories preserved in all plants producing items of dubious essentiality. Surviving inventories of basic materials might contribute a crucial element of flexibility to the reorganizing economy, and this advantage could be lost if the inventories were converted into finished products which turned out to be in relatively abundant supply.

The foregoing sketch of the possible forms of economic organization during the survival phase contains several elements that are prominent in current thinking on the subject in the Office of Emergency Planning. In particular, the necessity for planning for rationing and price control at the state and local level is emphasized. The general requirement for governmental control over the allocation of resources

is recognized as the consequence of the obvious infeasibility of an immediate restoration of a private ownership economy regulated by markets, plus the dominance of redistribution of existing stocks among the nation's economic tasks. However, in the picture developed above, efforts to maintain production of essential services and survival items are considered to be based primarily on the possibility of running down input inventories, and only incidentally on the possibility of obtaining additional inputs on an ad hoc emergency basis--with only minimal recognition of private property rights. This appears to be a point of difference with the view implicit in official planning, in that no evolution of emergency allocation measures into a comprehensive and regularized system of direct economic controls is contemplated. The significance of this difference in viewpoint is minor in the early survival phase, but becomes marked as the survival phase blends into the reorganization phase--as the following section will indicate.

IV. The Reorganization Phase and the Achievement of Viability

With transportation, electric power and other utilities functioning in the undamaged areas under government control, the homeless in temporary shelter, and emergency food distribution systems established, the nation would be able to live mainly on its inventories and the services of surviving durable goods for many months. As time passed, however, the depletion of inventories in those sectors directly engaged in meeting the essential needs of the population would create the necessity for at least a minimal recovery of production in the industries providing current inputs to those sectors. For example, some resumption of production in petroleum refining would be required during the first year, even under austere rationing, to meet requirements for fuel and lubricants in transportation, power generation, and elsewhere. The depletion of retail and wholesale food stocks would make the processing of grain stocks an urgent matter. The wearing out of clothing would bring the pressure to the apparel and textile industries. If a marked decline in the quality of the nation's diet were to be avoided, an early resumption of production in dairying and produce farming would be needed, and, in the second year

after the attack, the depletion of grain stocks would become a matter of concern. Assuming success in all these tasks, urgency would finally extend to replacing durable equipment as it wore out and expanding capacity in the hardest hit of the basic industries.

Thus, the necessity for new production would spread back through the economy from the industries directly engaged in meeting basic needs, touching particular industries at times dependent in large measure on the durability of their products, the size of surviving inventories of those products, and the magnitude of the essential requirements for them. This spreading process would not involve a strictly linear progression from "later" to "earlier" stages of production, but would include a complicated pattern of loops as industries were touched with the indirect effects of their own demands for inputs. For example, electric power is essential to most industries, and at the same time electric power generation requires fuel and equipment inputs from other industries. Such circular relations among industries are relatively unimportant so far as current flows of inputs are concerned, but become much more prominent when the services of durable plant and equipment are considered.

In some circumstances, requirements for ordnance and other components of the support of military forces, or for aid to other nations, might be judged by policy makers to be almost as urgent as the essential consumption requirements of the population. If so, the pattern of demands spreading through the economy would obviously be somewhat different from that suggested above. However, the production of advanced technology weapon systems in the aftermath of a nuclear attack which destroyed many of the largest urban areas is so plainly infeasible that it is difficult to believe that the attempt to do so would be long pursued. It is, after all, a seriously challenging technological task to produce such systems and maintain them in working order even with a fully intact economy. As for the other components of military demand and the possibility of aid to other nations, the pattern of requirements imposed on the industries of the economy would not differ too much from that imposed by a corresponding increase in consumption requirements.

The discussion of the reorganization phase in the following pages is predicated on the assumption that the effort to support military forces and extend aid

to other nations in the post-attack period would not be pressed to the point where the achievement of viability would be threatened--i. e., that national priorities have been accurately characterized in Section I. Except in cases involving levels of attack on cities so low as to leave no question of the technological feasibility of achieving viability, this assumption would certainly imply that national security programs would claim a smaller percentage of the nation's output than they do at present.[54] It is further assumed that the attack would not follow an extended period of economic mobilization that, as noted in Section III, might leave inventories well below normal and consequently tend to eliminate the sharp decline in the immediate threat to population survival that defines the end of the survival phase. Finally, it is assumed that the weight of attack on urban-industrial targets would not be much over 2000 megatons, and that the total pre-attack expenditures on pre-preparedness programs, shelters included, would amount at most to perhaps 25 billion. As is indicated below, these last assumptions characterize a situation in which the nation would be relying primarily on the survival of a substantial proportion of its ordinary productive facilities and inventories rather than on extremely elaborate programs of stockpiling, construction of underground factories, and so forth.

Technological Aspects of Achieving Viability: Qualitative Discussion

From the technological point of view, the problem of achieving economic viability is a problem of meeting a time schedule of requirements by making use of surviving productive facilities and inventories and the efforts of the surviving labor force. Or, in the terminology of Section II, it is a matter of whether the initial stocks of various resources available to the productive machine are such as to make feasible a time sequence of outputs in which the labor supply is never forced significantly below the initial level and quantities of output sufficient to meet other essential needs--e. g., support of the nonproductive elements of the population--are withdrawn from the machine at appropriate times.

[54] National defense, space, and foreign aid programs accounted for slightly less than 10 per cent of gross national product in 1964.

An Illustrative Model. Before proceeding with a brief discussion of the currently available quantitative information on this question, it will be helpful to examine an illustrative model of it that brings out its gross features, and then to discuss some of the more detailed mechanisms in qualitative terms. Imagine that the productive machine employs only three resources: labor (the quantity of which will be denoted by the letter "L"); capital (K), meaning such "produced means of production" as machines, buildings, etc.; and food (S). Labor and capital may be employed to produce either food or more capital, and the output from given quantities of labor and productive capacity can be either a certain number of units of food or an equal number of units of capital, or any combination of the two adding to the same total. That is, food and capital have identical production functions and resources may be shifted freely from the one sort of production to the other. Food is required to "produce" labor; every unit of labor requires at least c units of food in a given time period if it is to be available in the following time period, and this is the only consumption requirement. Furthermore, food supplies are always equitably distributed over the labor force. The productivity of labor increases when the amount of capital per "worker" ($\frac{K}{L}$) increases, but at a diminishing rate. Depreciation reduces the stock of capital by a certain fraction (d) at the end of each time period. There is a fixed non-consumption requirement R which must be met in every time period and is considered to be a requirement for new capital goods (for export, or for military use); it must be met out of new production.

Let $p\left(\frac{K}{L}\right)$ be the function relating the productivity of labor to the amount of capital per worker. Then with labor force L and capital stock K, the machine can produce a total output $L\, p\left(\frac{K}{L}\right)$. If the economy is to be considered viable in a given time period, this quantity of output (in the form of food or capital in any combination) must be large enough to meet the current consumption requirement, c L, the fixed requirement, R, and make good the depreciation of capital, d K. That is, the economy is viable if K is large enough relative to L so that

$$L\, p\left(\frac{K}{L}\right) \geq cL + dK + R$$

For a given L, let $\overline{K}$ be the smallest value of K satisfying this condition, so that

$$L\,p\left(\frac{\overline{K}}{L}\right) = cL + d\overline{K} + R$$

Then the economy is viable if $K \geq \overline{K}$.

If, at the end of the survival phase, the economy has a stock of capital smaller than the required level (for the surviving labor force L), and it possesses no inventory of food, then it cannot achieve viability. The fixed requirement and the consumption requirement may be met for the time being, but the depreciation of the stock of capital cannot be made good. Eventually, capital would decline to the point where the consumption requirement could not be met, and the labor force would abruptly decrease. However, if there is a surviving inventory of food, the economy may achieve viability even if it is initially nonviable. An initial inventory of S_o units of food will support the entire labor force for $\frac{S_o}{cL}$ time periods. During this period of time, any excess of output over the sum of depreciation and the fixed requirement may be used to increase the stock of capital according to the relation

$$K_{t+1} = K_t + L\,p\left(\frac{K_t}{L}\right) - dK_t - R$$

Of course, if there is no such excess, viability still cannot be achieved. The system will inevitably collapse when the food inventory is exhausted. But if an increase in the capital stock can be made in the first period, further increases can be made in subsequent periods until the food inventory is exhausted. If, at this point, the stock of capital is at least equal to $\overline{K}$, then viability has been achieved and the stage is set for recuperation. If the stock of capital is still below $\overline{K}$, collapse will occur.

The situation is summarized in Figure IV-1, page 392. The level K^* of capital is the level that will just permit the fixed requirement and depreciation demands to be met:

$$L\,p\left(\frac{K^*}{L}\right) = dK^* + R$$

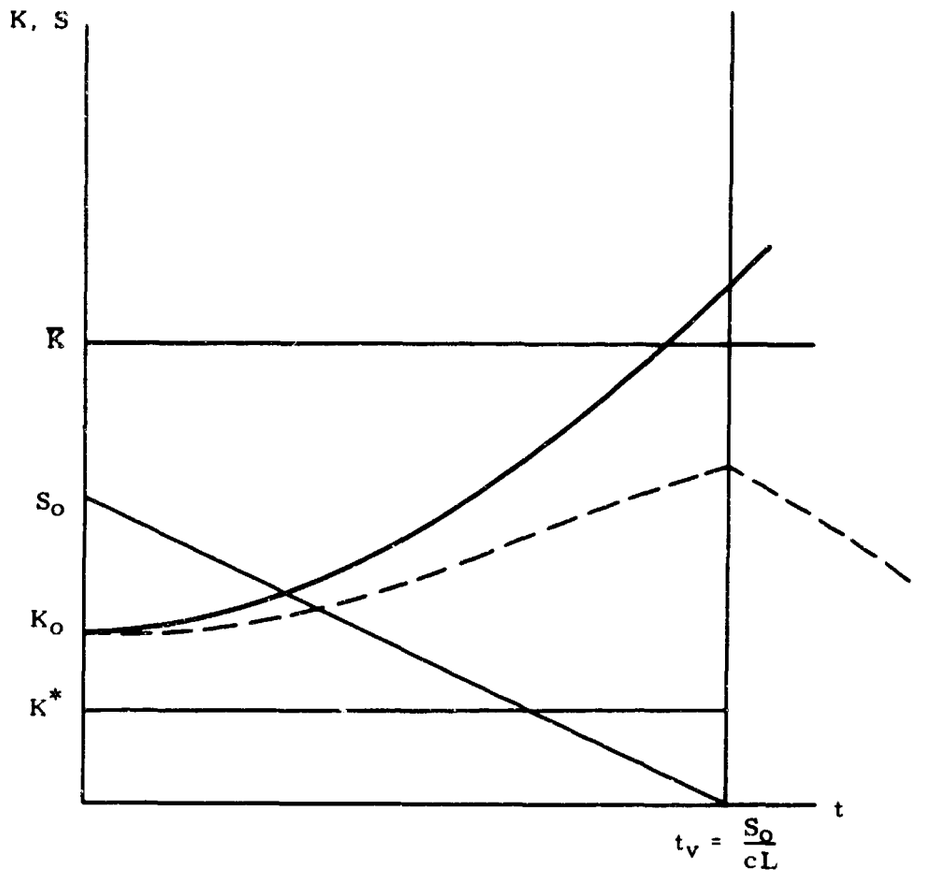


Figure IV-1

SUCCESS AND FAILURE IN ACHIEVING VIABILITY

K	=	Capital
S	=	Inventory of food
K^*	=	Capital required for temporary recovery
L	=	Labor
$\bar{K}$	=	Capital required for viability
S_o	=	Food inventory at end of survival period
K_o	=	Capital at end of survival period
t_v	=	Time of depletion of food inventory
S_o/cL	=	Ratio of food stock to food requirements per period

If the surviving capital is at or below this level, not even a temporary recovery of output and capital stock can be achieved, regardless of the surviving food inventory. This, it may be assumed, could only be the result of an excessive fixed requirement--it would always be possible to produce enough output to cover depreciation alone.[55] If surviving capacity exceeds K^*, a temporary recovery will occur with two possible outcomes. Either capacity will be increased to $\overline{K}$ by the time the food inventory is exhausted (the solid curved line), or it will not (the broken curved line). The difference between the two cases might represent, for example, the difference between two possible sizes of the fixed requirement, or it might represent two possible assumptions as to the productivity of labor.

Thus, in this simple model, the reorganization phase can be described very simply as a race between the exhaustion of the food inventory and the recovery of output. Provided that the fixed requirement is not too large, a large enough food inventory will always afford enough time for reconstruction of the required amount of capital. It should also be noted that, for small values of the fixed requirement and a given level K_o of surviving capital, an increase in the surviving labor force L will increase the size of the food stock that must survive if viability is to be achieved. An increase in L not only shortens the time that the food stock will last, but it also increases the level $\overline{K}$ of capital that must be achieved during this time. In general, these effects will not be overcome by the contribution of the additional labor to output.[56]

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[55] If the initial surviving capital were far in excess of the required amount $\overline{K}$, it might be impossible to avoid some decline in the capital stock--but once such a decline occurred, viability would be achieved. A more realistic model would recognize that some plants cannot produce any output at all without a certain amount of labor, and that the specific types of equipment required for viability with a very small labor force might not have been in use in the pre-attack economy. In this case, there might be a failure to achieve viability in spite of a great excess of capital per worker, because of the inappropriate character of that capital. Such an eventuality can be safely ignored given the characteristics of the weapons, the weights of attack, and the preparedness programs assumed here.

[56] See Economic Viability..., Appendix A, pp. 161-172, for a formal discussion of the effects of an increase in L in this model.

This model serves primarily to provide a clear illustration of the possibility of a temporary recovery of production, supported by drawing upon inventories, followed by a "viability crisis" as inventories are depleted and the demands to be satisfied from current production begin to mount at a rapid rate. It warns against the practice, all too common in studies of post-attack conditions in individual industries, of considering only the current demands to be satisfied over some arbitrary time period after the attack such as one or two years. The problem of achieving viability must be viewed as a whole, with full attention not only to the rates of consumption that surviving inventories would support, but also to the total task that must be accomplished before those inventories are completed.

Economic Reality and Limitations of the Model. There are, of course, many features of economic reality that are not represented at all in this highly aggregative view of the problem. The great diversity of types of productive facilities, together with the prospect of large differences in rates of destruction among the various types, precludes a realistic characterization of the situation in terms of an aggregate capital stock. Some of the surviving capacity would be useful only for producing inessential goods such as consumer durables, and would not be worth operating at all. In other cases, conversion of capacity to more essential uses could be made, but only at a cost in terms of labor and material inputs that might or might not have more urgent alternative uses. Very high rates of destruction in electric power generation and transportation would be much more crippling than corresponding destruction in, for example, the machinery industries. For without electric power and transportation, surviving capacity in other industries would be close to useless; on the other hand, the loss of the machinery producing industries would impose no such severe limits on the utilization of the surviving capacity in other industries. Electric power and transportation thus illustrate the phenomenon of "self dependence", in which the destruction of an industry strongly inhibits its reconstruction, regardless of the survival of capacity in other industries.

Similarly, a realistic view of the productive machine would have to recognize the wide range of possibilities for substitution among resources both in production and consumption. For example, the nation's diet could be adjusted

in many different ways to reflect the availability of various types of uncontaminated land, farm machinery and fuel, fertilizer, manpower, food processing capacity, and so forth. The basic materials--steel, aluminum, wood, copper, etc.--have overlapping areas of possible application, within which adjustments can be made on the basis of relative scarcities. The same is true of energy sources, and of transport modes. Of particular importance is the possibility of economizing on manpower, high quality materials and capital goods by sacrificing durability--and thus postponing resource demands to a later time when output will be larger. A similar deferral of resource demands can be accomplished by using plant and equipment more intensively, for example, by going to multi-shift operations in industries in which this is not standard practice. This has the effect of making the construction of new plant and equipment unnecessary, but at the expense of having to replace existing facilities at an earlier date. Replacement itself can be deferred, however, by expending more labor on maintenance and accepting a lower productivity of labor on the equipment in use. Finally, as noted above, the equipment in one industry may be used to perform tasks previously performed in another industry--especially when the equipment involved is identical, which is often the case.[57]

The foregoing does not begin to exhaust the possibilities for a qualitative discussion of the alternative ways in which the productive machine might be adapted to a given situation. But it serves to indicate that the analysis of the reorganization phase requires, in principle, a characterization of the technologically available opportunities that must simultaneously be highly detailed, integrated in the sense of allowing for all of the ramifications of given actions, and capable of application to to a wide range of possible post-attack situations. In fact, the only available characterizations are quite crude and can provide only rough approximations to the

[57] In particular, the great bulk of the machine tools and metal-forming machines employed in the metalworking industries are general purpose machines that can be used to produce a wide variety of products. This means that much of the capacity in any given industry could be converted, if necessary, to the production of items normally produced in another industry. See the discussion by H. M. Markowitz and A. J. Rowe, "The Metalworking Industries," Chapter 10 in A. S. Manne and H. M. Markowitz (eds.), Studies in Process Analysis (New York: John Wiley and Sons, 1963), especially pp. 266 and 272-284.

technologically available alternatives after a given attack. By far the most ambitious attempt to provide the required characterization is the Program Analysis for Resource Management (PARM) system developed by the National Planning Association for the Office of Emergency Planning.[58] This system was designed for the precise purpose of developing and testing for feasibility alternative time schedules of requirements on the economy. In its prototype version, the central description of production possibilities in the economy is in terms of over three hundred distinct production activities, plus one hundred thirty-five construction activities. By the standards of previous attempts to cope with the same general problem, this represents an enormous amount of detail. It is clear that the information obtained from PARM computations on various hypothetical post-attack situations will, in the future, constitute the main source of quantitative information on the problem of achieving viability--at the time of this writing, the system has been run only on an experimental basis. Nevertheless, it is important to note that the PARM characterization of the productive machine is still quite crude. The geographical distribution of economic activity is not reflected in the basic description of production possibilities, nor does the system automatically carry out many of the substitution possibilities referred to above. These deficiencies can be, and are intended to be, compensated for by the liberal introduction of expert judgment in the course of the computations. But it is clear that the information base of this expert judgment is of crucial importance, and a major effort to improve that base is probably called for.

Technological Aspects of Achieving Viability: A Quantitative Survey

In the absence of PARM calculations for a wide range of hypothetical post-attack situations, still cruder techniques must be employed to acquire a perspective on the size and distributions of attack that might seriously threaten the attainment of viability. Generally speaking, what can be obtained at present

[58] A general description of the PARM system may be found in John DeWitt Norton, "An Introduction to the Post-Attack Recovery Planning System" (Washington, D. C.: National Resource Evaluation Center, Office of Emergency Planning, August, 1964). (Technical Report No. 42.)

is an indication of the size of the task of achieving viability, rather than a full analysis of the feasibility of accomplishing that task. The discussion that follows is based primarily on a more complete treatment by the author in Section VII of "Economic Viability after Thermonuclear War: The Limits of Feasible Production".

The Gap between Present Consumption Levels and Subsistence Needs. By far the most important fact bearing on the ability of the economy to support the survivors of a nuclear war is an enormous gap between present levels of consumption and anything that could reasonably be regarded as a subsistence level. For example, only a little over 30 per cent of the 1964 gross national product would be required to provide the per capita consumption standards of 1933 to the entire 1964 population. Less than a quarter of current output would be required to provide the consumption standards characteristic of the turn of the century.[59] It is clear, therefore, that large losses of productive capacity relative to population losses could be sustained without threatening the economy with nonviability for technological reasons--provided that the destruction did not fall disproportionately on precisely those sectors that produce essential consumption goods, and that the surviving capacity in transportation and the other utilities permits the other types of capacity to be utilized.

Food Stocks. The next most important fact is the high probability that surviving food stocks would be adequate to support the surviving population for roughly two years. The importance of these stocks is not at all measured by their value at current prices, which of course is small (less than $15 billion) compared to

[59] See Economic Viability..., Table 1, p. 97, for similar comparisons. The 1964 gross national product at 1954 prices (the basis used in the table cited) was $515.7 billion. The 1933 level of personal consumption expenditures per capita, in 1964 prices, was $824. For the 1964 population of 192 million, this amounts to approximately $158 billion. (Gross national product figures for 1964, cited here and elsewhere, are from Appendix B in The Annual Report of the Council of Economic Advisers (1956) (Washington, D.C.: U.S. Government Printing Office, January, 1965).

the total value of the wealth that would survive. Rather, their importance derives from the mechanism set forth in the simple model of the situation--the larger the food stocks, the more time is afforded for the restoration of the capacity needed to support food production in the future. But the simple model does not correctly represent the working of this mechanism, for it neglects the fact that, up to a point, a given labor input will yield a larger product if it is applied over a longer period of time. When a series of tasks must be performed in a fairly rigid sequence, as is typically the case in construction projects, a higher rate of application of input will not result in a proportional advance of the completion date. Thus, to the extent that there are technologically determined limits on the minimum time required for construction of a petroleum refinery, a fertilizer plant, or a railroad link between two points, the ability to subsist out of inventory for a certain period can be crucial out of all proportion to the normal value of the inventory. By exactly the same sort of argument, the simple step of locating food stocks roughly in accordance with the probable distribution of the surviving population may effect an enormous reduction in the barriers to the achievement of viability.

Granting that the present economy is far from the margin of viability, and the specific importance of the food stocks in affording time for a certain amount of reconstruction, there remains the problem of determining the range of attack sizes over which these general observations might reasonably be accepted as indicating the technological feasibility of achieving viability. A procedure for answering this question involves the following steps: First, one or more estimates of the size and composition of "subsistence consumption" per capita must be formulated. The second step is to determine the proportions of existing capacity in various sectors that would be required in order to meet the estimated consumption standards for the entire population.

Industrial Capacity. Third, the changes in per capita capacity in all industries must be determined for various sizes and patterns of attack, and ranges of shelter conditions. To define a range of possible situations, it is useful in particular to consider the possibility that the attack is directed against population, or,

alternatively, that it is directed against the industrial sectors in which the most serious "bottlenecks" can be created. Given a particular assumption as to the pattern of attack, it is possible to determine the level of attack that will reduce surviving capacity per capita in some industry below the level previously determined to be "required." Of course, since any feasible classification of economic activity into distinct industries always involves a considerable amount of aggregation, the fact that capacity in a given industry is above the requirement does not necessarily mean that capacity in all of the sub-sectors within that industry is above the required level. Therefore, it must be assumed that such intraindustry imbalances in the surviving capacity could be remedied by conversion or construction of new capacity within the period of grace afforded by surviving inventories. Only a more detailed analysis of technological possibilities can suggest whether this assumption represents an overstatement of the technological flexibility in the economy.

Finally, as a largely separate part of the analysis, there should be some attempt to determine whether transportation and other utilities would represent a severe bottleneck for levels and patterns of attack at which other types of capacity would be more than adequate. It is clear, of course, that the utilities would be constraining in the absence of major efforts to deal with a large amount of minor damage to the various networks. Indeed, the need for such repairs would be so urgent that it is necessary to assume that preparedness programs would be adequate to assure the completion of most of the minor patchup work at an early date in the reorganization phase. The remaining question is whether the destruction of major system components would be so great as to require a significant amount of new production of such components as would be required during the reorganization phase--e.g., whether the surviving quantities of generators, railroad rolling stock, bridges, water purification plants, etc., would be adequate to support reorganization or would require some augmentation. This question could be answered in a rough way by considering the total national supplies and requirements for such components by the same techniques employed for other sectors--but such an analysis should certainly be supplemented by an examination of the geographical distribution of the immobile components.

The foregoing program of analysis was carried out, although in a rather crude way, in the RAND memorandum cited above. The principal results may be summarized briefly. First, surviving capacity in the manufacturing industries most directly involved in providing essential consumption goods should be adequate, at least in the aggregate, even after attacks of several thousand megatons against population centers. If it is assumed that the population is protected against fallout, then an attack directed against population as large as 4000 megatons would not reduce the per capita capacity in this "survival industry" category much below the levels of the late 1930's. An attack against survival industry itself would be another matter. On the same assumption about population protection, the feasibility of providing 1933 consumption standards to the surviving population would be in question at an attack level of 1000-1500 megatons (10-megaton weapons). For lower levels of population protection, the per capita balance would of course be improved. With approximately perfect protection of the population, 1933 standards might be unattainable at attack levels of 500-750 megatons.[60]

The broad category of "recovery and military support industry" consists primarily of heavy manufacturing industries--iron and steel, transportation equipment, farm machinery, and so on. This category is significantly more concentrated geographically than survival industry, and an attack directed specifically at the most lucrative targets in this category would have correspondingly larger effects on surviving capacity per capita. Less than 100 10-megaton weapons, accurately delivered, would reduce surviving capacity per capita to 50 per cent of the pre-attack level, assuming complete fallout protection. However, assuming that "military support" would be negligible, the demands placed against these industries for the sole purpose of supporting a minimum consumption standard would be quite small. Under normal conditions, a generous estimate of the fraction

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[60] For the purpose of these comparisons, the percentage of survival industry capacity per capita assumed required to meet the 1933 standard has been estimated at 55 per cent, roughly the ratio of 1933 to 1960 per capita consumption of nondurable commodities. This is a different, and probably superior, procedure from that used in Economic Viability..., pp. 100-107, which also differed in that a 1940 rather than a 1933 standard was used. Otherwise, the calculations are based on the survival curves presented in Figure 4, p. 85, of Economic Viability....

of gross durable goods output required to make good all depreciation on equipment and structures directly or indirectly involved in the production of goods and services for consumption would be 20 per cent.[61] A decline in over-all per capita consumption levels by roughly 50 per cent (to 1933 levels) would thus mean that about a tenth of present capacity per capita should suffice to meet this depreciation requirement. There would be an additional requirement for making good the depreciation of essential durables in the hands of consumers, but the decline in per capita consumption of durables would of course be much larger than the average decline in consumption. This in turn probably means that the previous estimate of

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[61] This is the result of assuming (1) that "capital consumption allowances" in the national product tables approximate total physical depreciation in the economy, (2) that this total can be allocated among production for consumption, government, net investment, etc., according to the proportions that these categories represent of net national product. For 1958, this leads to the conclusion that half of the 1958 gross private domestic investment might have been required to make good the depreciation of capacity producing consumption goods, the capacity producing replacements of that capacity, and so on. (Both of the assumptions made probably tend to make this figure an overstatement.) Assume further that the industry distribution of this replacement demand is roughly the same as that of gross private domestic investment. Then the question becomes: how much of the 1958 output of various durable goods would be required, directly or indirectly, to carry out half of the 1958 gross investment? A rough answer to this can be obtained on the basis of Table B in M. R. Goldman, M. L. Marimont, and B. N. Vaccara, "The Interindustry Structure of the United States," Survey of Current Business, XLIV, 11 (November, 1964), p. 14. That table gives the percentages of gross output required, directly or indirectly, to meet gross investment demands in 1958. For durable goods industries, excluding construction, the percentages vary from 73.0 (farm machinery and equipment) down to 2.8 (ordnance and accessories). An over-all weighted average may be computed, using as weights the value added figures provided in W. W. Leontief, "The Structure of the U. S. Economy," Scientific American, CCXII, 4 (April, 1965), pp. 30-31. (The dollar figures shown there correspond to the 1958 patterns, though not to 1958 totals.) The result is that 33 per cent of the aggregate gross output of the durable goods industries, excluding construction, was required to meet the gross investment portion of final demand. Half of this gives 16.5 per cent as the desired figure. The "Recovery and Military Support Industry" category excludes construction, but includes a few classifications from the chemicals industry; the most relevant figure on this basis would be 16 per cent. Although the Recovery and Military Support Industry category excludes many subclassifications in the durable goods industries, there is no reason to think that this substantially affects the outcome. In any case, the 20 per cent figure makes an additional allowance for the possible shortcomings of this calculation.

durables is excessive, since producers' durables are probably disproportionately required in the production of consumer durables as against nondurables and services. All things considered, it seems very likely that the proportion of present durables capacity required for the maintenance of 1933 consumption standards would be between 10 and 20 per cent.

It turns out, then, that the greater geographical concentration of recovery and military support industry is more than offset by the smaller role that these industries would play in a barely viable economy. Even if the attack were directed specifically against the recovery and military support category, the attack levels that would make 1933 consumption standards unattainable are twice the corresponding levels for survival industry. It should be noted, however, that an attack large enough to destroy 80 per cent or more of this broad aggregate could certainly be redesigned to destroy 100 per cent of the capacity in specific categories. A more detailed analysis might reveal that some of these specific bottlenecks might be created at fairly low levels of attack, but it would also reveal conversion possibilities not taken into account here, and it would probably also show that the consequences of delays in reconstruction in the hardest-hit could be mitigated considerably by expending more effort on the maintenance of the surviving stock of products, "cannibalizing" broken machines for spare parts, salvaging materials from damaged structures, and so forth. There is, in short, little reason to believe that the industries in this category represent the economy's most vulnerable point in terms of preventing the achievement of viability.

Agriculture and Supporting Industries. In spite of the existence of large food stocks, the most serious obstacles to the achievement of viability would probably arise in agriculture and its supporting industries--including in particular petroleum refining, pesticides and fertilizer production, and transportation. While blast and fire damage would be relatively inconsequential in agricultural areas, an attack in which thousands of megatons were surface burst over U.S. missile sites would cover the nation's most productive agricultural areas with high levels of fallout radiation. In the absence of adequate fallout protection, over half of the

farm population might be killed.[62] Losses of food animals would be large, but under the circumstances leading to the highest losses in the human population the per capita supplies would probably increase. In the longer run picture, ecological imbalances resulting from the differences in the vulnerability to fallout radiation of different organisms present a threat to agriculture whose magnitude is difficult to evaluate. But the threat is sufficiently well defined to make it definitely imprudent to assume that significant reductions in the use of pesticides in agriculture could be made. Another long-run threat involves the prospect of floods and erosion problems as a consequence of radiation kill of ground cover.[63]

Two of the industries supplying current inputs to agriculture have been identified as potentially serious bottlenecks. First, petroleum refining is highly concentrated geographically and relatively well separated from the population. About 50 target areas contain over 80 per cent of the petroleum refining capacity, and less than 6 per cent of the population. An attack of 1500 megatons (on 150 target areas) could destroy essentially all of the petroleum refining capacity. The picture is further darkened by the even greater concentration of port capacity capable of accommodating ocean-going vessels; less than 2000 megatons, perfectly delivered, will destroy both the ports and the petroleum refineries.[64] Although it is plain that the present capacity in petroleum refining is far in excess of austere post-attack requirements, it is equally clear that nothing like the present locations and techniques of agricultural production would be possible without fuel for agricultural machinery, trucks, and diesel locomotives. Even assuming the total elimination of petroleum demands by governments and for operation of private motor vehicles, it would be difficult to make the case that the economy could be made

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[62] See O. E. Williamson and K. D. Moll, Postattack Farm Problems, Part II: Attack Effects on Inputs and Farm Output (Menlo Park, Calif.: Stanford Research Institute, October, 1961), p. 43.

[63] See Report of Panel on Postattack Recovery Program, op. cit., Appendix F, for a discussion of ecological effects, erosion, etc.

[64] Economic Viability..., Tables 17 and 19, pp. 212 and 214.

viable with less than 10 per cent of its present use of refined petroleum products.[65] Success in achieving viability after an attack which wiped out all petroleum refineries would therefore depend on success in building new refineries with 10 per cent of present capacity before inventories of petroleum products were exhausted.

Pesticides production is the second example of a potentially serious bottleneck in an industry providing current inputs to agriculture. Pesticides are produced by a variety of processes employing a fairly wide range of basic chemicals. The vulnerability of the industry, according to a Stanford Research Institute study, lies only partly in the fact that some of the chemical inputs are produced in only a handful of plants, generally located in major population centers. Equally significant is the fact that a fairly elaborate sequence of operations, performed at widely separated points is often involved in the production of a particular pesticide. Thus, even assuming the availability of inputs, the industry may be crippled by the disruption of transportation, and its vulnerability to organizational difficulties is high.[66]

Shortages of railroad transportation might well compound the difficulties noted above and also hamper the distribution of food to consumers. Aside from a shortage of diesel fuel if petroleum refineries were attacked, the most serious constraints on railroad operations would probably arise from the destruction of classification yards--a resource which cannot be moved about in response to the

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[65] The Stanford Research Institute study, The Effects of Nuclear Attack on the Petroleum Industry, concludes that "threshold of recovery" requirements for gasoline and distillate would be about 7 per cent and 2 per cent respectively of pre-attack consumption per capita. However, as is pointed out in Economic Viability..., pp. 109-111, these estimates do not reflect the full requirements for viability. On the basis of the 1958 input-output study ("The Interindustry Structure of the United States," op. cit., Table B and Table 3) it may be estimated that 27.1 per cent of the gross output of petroleum refining and related industries in 1958 was required to meet consumption demands other than the direct use of gasoline and other petroleum products by consumers--e.g., for production and transportation of food. Assuming the total elimination of this direct consumption demand plus all nonconsumption final demands, and the reduction of the remaining consumption demands in the ratio of 1933 to 1958 per capita consumption, one is still left with a requirement for 14 per cent of 1958 gross output. Of this, over half is accounted for by the use of petroleum in agriculture and transportation.

[66] See Postattack Farm Problems, Part II: Attack Effects on Inputs and Farm Output, op. cit., Chapter X, pp. 151-172.

geographical pattern of demands, and is particularly likely to be destroyed in attacks on population centers. A Stanford Research Institute study of the post-attack rail transportation system concluded that almost half of the major classification yards would be destroyed in a 1500-megaton attack on military and population targets. Although the study concluded that the railroads would be capable of carrying out the necessary distribution of food stocks after such an attack, the question of whether the network would meet the transportation requirements of a viable economy was not examined. It seems likely that at levels of attack somewhat over 1500 megatons, the destruction of classification yards and other breaks in network links might well make the system incapable of meeting these larger requirements.[67]

Attack Levels and the Achievement of Viability. There are, then, several different points at which an attack of about 2000 megatons on urban-industrial targets might reduce the surviving resources well below the level consistent with viability--assuming levels of population survival such as might be assured by a complete fallout shelter program. This does not, of course, demonstrate that 2000 megatons is the attack weight at which the achievement of viability would suddenly become impossible. A detailed analysis might reveal that it would be impossible at lower levels of attack--if it turned out that the details of the composition and geographical distribution of surviving inventories and productive facilities were sufficiently unfavorable. Or it might be that the economy would be capable not only of the many feats of conversion, repair, and improvisation of new methods that are implicit in the use of highly aggregative measures of surviving capacity, but also of carrying out substantial programs of construction of new petroleum refineries, pesticides factories, port facilities, and so forth within the time allowed by surviving inventories.

Nevertheless, the evidence is persuasive th. with the population well protected from fallout, the task of achieving viability would be of a different order

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[67] See A System Analysis of the Effects of Nuclear Attack on Railroad Transportation in the Continental United States, op. cit., especially Section VIII. It should be noted that the conclusions stated in the front of the volume (p. xiii) give an impression of the results that is considerably more optimistic than that presented in the text.

of magnitude after an attack on urban-industrial targets of, say, 3000 megatons as compared with what it would be after an attack of 1000 megatons. At the lower level, the task is mainly one of making minor repairs to assure the effective use of the surviving capabilities of the productive machine. In any aggregate terms, the productive capabilities lost are well within the margin by which existing capabilities exceed the essential minimum. Although capacity in particular industries could be reduced to zero or close to it by appropriate design of the attack, the surviving capacity of industries not specifically targeted would be well above requirements--and inventories of the targeted industry's products would presumably be high as well. In the specific case of petroleum refining, 97% of the capacity might be destroyed--but over half of the port capacity would survive this attack, and it should be possible to import the rather small amount of petroleum products required. At the higher level of attack, there is not only the possibility of the total loss of some key industries, but there would be relatively few sectors in which useful capacity survived in amounts much in excess of requirements. The actual reconstruction of large parts of the productive machine would be necessary, but probably impossible as a result of the total absence of some key sectors. Suppose, for example, that 2000 of the 3000 megatons are directed at the top 200 targets in terms of survival industry. About 60% of the population would survive, but only 30% of the survival industry capacity--less than the amount required to maintain 1933 living standards. In addition, these same 200 weapons would destroy almost two-thirds of the recovery and military support industry, over 40% of the petroleum refining capacity, 30% of the electric power-generating capacity, and almost three-fourths of the port capacity. The full results of this hypothetical targeting are given in Table IV-1,[68] page 407. The remaining 1000 megatons could destroy the remaining petroleum refineries and ports, with weapons left over. Railroad transportation would certainly suffer much more severely than in the 1500 megaton attack discussed earlier. Needless to say, as the hypothetical level increases above 3000 megatons, the number of potential bottlenecks mounts rapidly.

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[68] See Economic Viability... , Table 16, p. 211. The data sources and methods used in deriving this table are discussed in ibid. , Appendix C, "Technical Notes on the Derivation and Use of Survival Curves". The basic data for these curves were compiled by the National Resource Evaluation Center, Office of Emergency Planning, from original sources in the 1957 Census of Manufactures and 1961 Census Bureau estimates of the U.S. population.

TABLE IV-1

CONCENTRATION OF RESOURCES: AREAS RANKED BY SURVIVAL INDUSTRY

Number of areas*	Resource (%)					
	Population	Recovery and military support industry	Survival industry	Petroleum refining	Electric power	Ports
10	10.8	20.5	19.9	1.8	7.1	27.4
20	15.3	27.5	29.2	2.4	9.9	37.5
30	17.7	30.5	35.4	10.7	12.9	49.1
40	19.9	34.8	40.1	14.6	14.7	52.1
50	21.2	36.8	44.0	22.2	16.8	55.8
60	23.3	41.4	47.6	22.8	17.7	56.8
70	25.1	44.5	50.6	25.3	19.7	57.9
80	27.9	46.8	53.2	25.4	20.4	57.9
90	28.8	48.5	55.4	25.4	21.3	57.9
100	30.2	50.8	57.4	25.5	21.7	65.0
150	35.7	57.8	65.4	39.5	26.6	66.0
200	41.1	64.9	70.6	43.0	29.8	73.6

*Each target area is a square 20 km on a side, and represents approximately the area of destruction from a 10MT weapon.

(Source: Economic Viability ..., Table 16, p. 211; see Footnote 68 above).

The sharp increase in the difficulty of achieving viability over this range of attack levels implies a corresponding change in the character and size of the preparedness programs required to assure success. At the lower level, such programs should focus on measures to assure the effective utilization of the surviving productive capacity; in only a few narrowly defined sectors would it be necessary to plan for the quick construction of a significant amount of capacity. Preparations for quick repair of minor damage to transportation systems and other utilities would presumably dominate the picture, since these sectors are clearly crucial to the effective utilization of other productive facilities. The effects of these programs on post-attack production possibilities would be out of all proportion to their cost--the ability to repair a short length of transmission line or replace a railroad bridge might mean the difference between having and not having the use of several large factories. At the higher level, preparedness programs must compensate, in one way or another, for large deficiencies in surviving capacity in many sectors. Underground factories must be constructed, or large amounts of components stockpiled and inventories of consumption goods increased to the point where the surviving population could carry out the needed construction in time. The relations between costs and post-attack returns for these programs would be little different from those applying to the expansion of capacity at present--the effort takes the form of creating and putting aside the required amounts of productive facilities.

Per Capita Consumption and the Problem of Defining "Subsistence Levels". The foregoing discussion of the range of attacks at which the task of achieving viability begins to mount rapidly in magnitude is based on the assumption that per capita consumption levels on the order of those experienced in the U. S. in 1933 are relevant as the basis for "subsistence consumption" calculations. This assumption certainly could not be defended as an estimate of a physiological subsistence limit. At 1954 prices of consumption goods, the implied level of consumption expenditure per capita is $824--about 45% of the 1964 level. By way of comparison, the Council of Economic Advisers recently proposed a definition of "poverty" that, translated into the terms used here, corresponds to per capita consumption

less than about $650.[69] Thus, a reduction to the 1933 level would leave the average about 25% above the level now considered the borderline of poverty. However, a fifth of the population is below the borderline at present. If the same inequality of distribution were allowed to persist in the post-attack period, a fifth of the population would experience consumption standards of less than about 40% of the average--about $330 per capita.

The 25% difference between the 1933 standard and the present "poverty" standard is of little importance so far as the above discussion of attack levels is concerned. That discussion rests chiefly on the supposition that the near total loss of some key sectors would make it virtually impossible for the rest of the economy to function. It is important, however, to examine the relevance of an argument that would relate the subsistence standard to present standards in underdeveloped countries, or in the United States a century or more ago. According to this standard, the required consumption expenditures per capita might be a tenth or less of the present level, rather than a third or more as assumed here. A decline in consumption expenditures of this magnitude would involve a reversal of the historical process by which the production of food has come to require a smaller and smaller fraction of the economy's total resources--a reversion to a situation in which the fraction of the labor force employed in agriculture was over 60% as against the present 6%. Per capita expenditures on food would have to decline by something over 50%, but this decline would primarily take the form of reductions in processing, transportation, and distribution.

If the effects of the war on the natural environment were not too severe, the survivors probably could support themselves in such a "dedeveloped" economy--if the transition could once be accomplished. But the transition itself, taking place within the limited time afforded by the surviving food inventory, would present enormous difficulties. The geographical distribution of the population and of housing, the types of equipment on farms, and, most important, the skill distribution of the labor force are drastically different from what they would have to be to make such a

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[69] The Annual Report of the Council of Economic Advisers (1964), Washington, D.C.: U.S. Government Printing Office, January, 1964, pp. 57-58.

subsistence economy feasible. Furthermore, industrialization has taken a toll in terms of depletion of natural resources--including the soil, fuel wood supplies, wildlife--and pollution of water supplies that leaves the environment less favorable for subsistence agriculture than it was a century ago. An economy capable of overcoming all of these obstacles to a successful retrogression to an underdeveloped state would probably be capable of avoiding the retrogression itself. Certainly a successful retrogression--one accomplished without large population losses--would not "just happen," it would have to be the result of a deliberate, well-timed and effectively implemented policy decision. Such a decision would, of course, involve the renunciation of all aspirations for a speedy recovery of output and consumption to pre-attack levels.

For a brief period in 1945, the authorities in the American Zone of occupied Germany were operating under a policy directive (known as JCS/1067) which contemplated the conversion of the German economy to a predominantly agricultural one, lacking not only the capacity for war production but also any industrial base that might conceivably be used to restore such capacity. This policy appeared infeasible from the start to the individuals charged with administering it, and it was substantially modified under the terms of the Potsdam aggreements in August, 1945.[70] General Clay, then Deputy Military Governor in the American Zone, contended in May, 1946 that the U.S. Zone by itself could not be made self-supporting on any basis without "many years" of support by the U.S., and that even the U.S. and British Zones combined would require supplementary food imports for a few years.[71] In fact, the U.S. Zone passed through what would here be termed a "viability crisis" in the spring of 1946, and the bizonal (British-American) area underwent a similar experience a year later. Food rations declined to the point where the "vicious circle" effect on production became pronounced, and General Clay's account leaves little doubt that a fatal downward spiral was avoided only because additional food

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[70] Lucius D. Clay, Decision in Germany (Garden City, N.Y.: Doubleday and Co., Inc., 1950), pp. 17-18.

[71] Ibid., pp. 73-78.

was obtained from the United States.[72] The German experience is probably indicative of the situation that would arise in the industrial Northeast of the United States in the aftermath of a nuclear war; hopefully, the stocks of surplus grain would provide the crucial interim support that U.S. aid provided to Germany. Nothing in that experience suggests that viability could be achieved on the basis of an interregional division of labor drastically different from that which existed previously.

Thus, the use of a standard of subsistence consumption corresponding to historical consumption standards of the present century is based in part on the contention that a decline to significantly lower levels would require adjustments in the patterns of economic activity so drastic as to be comparable to the difficulties of achieving viability at a higher level. In the absence of an enormous shift in the farm-nonfarm distribution of the population, there is no way of freeing most of the resources required to produce, transport and distribute necessities by present methods. The fact that the same quantities of necessities might be produced by methods requiring drastically more labor and less equipment is irrelevant if the transition is not feasible within the available time.

A more important argument--particularly in relation to the use of 1933 consumption standards--is that the "technological" (physiological) conditions for the continued availability of the labor supply may be significantly less restrictive than the organizational ones. This possibility was noted in Section II, and some of the corresponding issues in the survival phase were discussed in Section III. Anticipating the further discussion of this problem immediately below, it may simply be remarked that nothing approaching complete success in achieving an equitable distribution of a given aggregate consumption is likely to be attainable. This implies that the average consumption that is just consistent with the achievement of viability is a good deal higher than physiological considerations indicate. What matters is the full distribution of consumption standards over the population when the effort to achieve more equitable distribution has been pressed to the point where the effort itself becomes counterproductive or threatens to provoke some sort of

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[72] Ibid., pp. 263-280, esp. p. 266.

secession from the national economy by the more fortunate individuals or regions. While a 1933 standard is essentially an arbitrary answer to the question thus posed, it would be difficult to demonstrate that it is unrealistically high. Much presumably depends on attitudes toward the Federal government, its legitimacy and the effectiveness and equity of its policies. The 1933 crisis of the politico-economic system provides a convenient standard of comparison for subjective judgments of the possible severity of a post-attack crisis.

Organizational Aspects of Achieving Viability: The Relevance of Historical Experience

The task of assuring the achievement of viability would pose problems of economic organization similar in fundamental respects to problems faced by governments in the past and, in some countries, at present. In a wide variety of situations, the objective of the policymakers is to obtain the largest possible output from the economy and at the same time to achieve a composition and pattern of use of output that is drastically different from that which the economic system would generate if "left alone"--i.e., if previously existing modes of economic organization were allowed to continue whatever the initial forms of economic organization. Whether the new pattern of output is needed to provide war materiel to make a "Great Leap Forward" in economic development, to achieve a more egalitarian distribution of consumption goods in the face of some disaster to the economic system, or to achieve economic viability, the same basic dilemma presents itself: To move the economic system out of its existing patterns of resource allocation by using the carrot of economic incentives is unsatisfactory because too much urgently needed output is absorbed as consumption by those who respond to the incentives. To move the system by using the stick of direct compulsion by the political authorities tends to depress total output, either because the population resists or evades the controls, or because the government lacks the technical competence to achieve efficient allocation by administrative measures, or both. Thus the authorities are faced, whether they realize it or not, with a choice between obtaining for their preferred purposes either a large share of a small output pie, or a small share of a large one. Although policies that combine the carrot and the stick have often

been attempted, examples in which the net effects on total output are negative seem to predominate in the historical evidence. And, in fact, it often appears in retrospect that the government's success in diverting output to its preferred uses was not sufficient to compensate for the shrinkage of the pie.[73]

This dilemma is inescapable. No economic system could be expected to display large scale shifts in the composition and distribution of output in response to mere generalized statements of preference on the part of the political authorities. Individual economic agents must be informed as to the change in their behavior that is desired, and, in one way or another, motivated to make the change. Regardless of the specific organizational devices used to perform this informing and motivating function, it is quite clear that the process is not automatic and costless, and that the cost is in some vague sense proportional to the size of the shift in patterns of economic activity that is demanded. If, as suggested above, governments have generally tended to err on the side of excessive reliance on direct controls and inadequate attention to incentives in their attempts to cope with this problem, this may be explained by the fact that the former often promises better short run performance than the latter, and it is only after a period of time that the decline in output becomes significant.

Lessons from American Economic Controls in World War II. It was emphasized in Section II, that the problem of economic organization in the aftermath of a nuclear war is clarified very little by references to the urgency of the demands upon the economy and the necessity for a complete mobilization of its capabilities. Similarly, the broad similarities between the post-attack situation and various historical experiences serve to suggest a range of possible policies and pitfalls, but provide little specific guidance. In particular, the American experience with

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[73] Jack Hirshliefer (op. cit.) has identified a "generalized disaster phenomenon" involving characteristic responses by governments to the particular economic problems of large scale national disasters. An interesting recent instance, distinguished by the fact that the disaster was almost wholly government made from the start, is the Chinese "Great Leap Forward". See Alexander Eckstein, "On the Economic Crisis in Communist China," Foreign Affairs, XLII, 4 (July, 1964), pp. 655-68.

emergency economic mobilization in World War II cannot necessarily be taken as the basic model; experiences in other nations in which the disruption of the system was greater or the economy was closer to the margin of viability are probably at least as relevant. What is required is a full consideration of the distinctive features of the economic situation following a nuclear attack (which were outlined in Section II), followed by the elaboration of organizational devices that are responsive to those particular needs. Since, however, the American experience in World War II is a leading example of reasonably successful use of economic controls, and since that experience has done much to shape official thinking on the problems that would arise after a possible future war, it will be helpful to recall the main features of those policies[74] and to evaluate their potential relevance in the aftermath of a nuclear war.

In World War II, U.S. policymakers confronted the following specific version of the basic dilemma described above: They wished to achieve the maximum possible expansion of production of armaments and other material support for the war effort. This entailed a large shift in the composition of output, requiring the conversion of factories to war production, geographical relocations of the labor force and expansion of some skill groups, and so forth. It implied further that the large amounts of income would be paid out to war production workers (and to stockholders of the relevant companies) to which no output of consumption goods corresponded. If these incomes were divided between consumption and savings in anything like the usual proportions, a large upward pressure on consumption goods prices would result. This would increase the profitability of production in the consumer goods industries, and firms in those industries would thereupon seek to expand production, bidding labor and materials away from war industries. At this point, the government would, if it adhered to peacetime procurement practices and abstained from controlling the economy, be faced with cost pressures on the prices for war goods. If it paid the higher prices it would further increase the purchasing power of its competitors in the market for all production, the suppliers of labor and other productive inputs.

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[74] See Clair Wilcox, Public Policies Toward Business (op. cit., Chapters 24 and 25), and the references cited therein, for more complete information.

An obvious solution to this dilemma would have been to raise individual income taxes and corporation profits taxes to just the point where consumer incomes after taxes would suffice to buy at current prices only that volume of consumer goods production that policymakers were willing to allow. This "pay-as-you-go" method would certainly succeed in restraining the production of consumer goods, if pursued vigorously enough. But the choice of an income tax system poses problems. If the rates are regressive, or only slightly progressive, then the highly paid workers in the most rapidly expanding war production industries are likely to bid the prices of necessities up to levels out of reach of the rest of the population. Even if these rapidly expanding industries are producing the most urgently needed outputs, it will hardly be satisfactory, either politically or economically, to let the rest of the population suffer malnutrition. On the other hand, if the rates are steeply progressive, the reallocation of labor, the working of overtime, and the entry of additional persons into the labor force will all be hindered. The small increase in income after taxes obtainable by moving to a new job in war production, putting in a longer work week, or adding another member of the family to the labor force will not compensate for the disadvantages of these steps for very many people. Thus the basic dilemma stands: If incentives in terms of claims on current output are to be used, their price in current output must be paid.

In World War II, American economic policy dispensed for the most part with incentives paid in current output. A reasonable degree of equity in wartime consumption standards was enforced by rationing coupled with price controls that kept prices from climbing out of reach of the less fortunate. Price control also served to hinder the expansion of output of consumer goods, a desirable result to the extent that resources were left free for war production, but undesirable to the extent that alternative sources of supply not competitive with war production were not encouraged. The desired shift in the composition of output was produced by a variety of direct controls, including curtailment and limitation orders restricting the production of nonessential commodities. The most important and effective of these direct control devices was the Controlled Materials Plan, which focused on allocating the supplies of steel, copper, aluminum and their alloys. Under this plan, developed in 1943 after the breakdown of other attempts at materials control,

materials requirements were first reconciled with prospective supplies by the government, after which allotments were made to manufacturers of end products. These manufacturers were empowered to pass the allotments along to suppliers and subcontractors, and so on back to the ultimate suppliers of the materials. This scheme had the substantial advantage of forcing the government to confront the fact of scarcity of basic materials in developing its requirements for end products. To the extent that the materials requirements and supplies (and their timing) could be accurately estimated, the system would be sure to generate and carry into effect feasible production schedules. However, it probably tended to diminish the incentives to search for ways of economizing the use of scarce materials, especially in the detailed design of small components.

Although incentives to work more and to change to higher paying jobs were undoubtedly limited by the rationing of basic consumer goods, they were certainly not eliminated. Some goods remained uncontrolled and unrationed, so the money left over after purchasing rationed commodities was by no means worthless in terms of current consumption. Furthermore, additional income earned during the war could be saved, in savings bonds or some other form, in anticipation of the greater satisfactions it would provide when goods became more freely available. In fact, personal consumption expenditures in relation to disposable personal income declined from 94.5% in 1940 to 74.8% in 1944, then rebounded to 97.2% in 1947.[75] Since the individuals who increased their saving in this dramatic way very likely failed to anticipate the extent of the increases in the general price level that occurred when price controls and rationing were removed, the incentive value of wartime earnings was high and the immediate upward pressure on prices was restrained. It is a matter of considerable importance whether the population would display an equal willingness to invest its savings in assets of fixed nominal value in a future national emergency, or whether the experience after World War II taught a lesson that will not be soon forgotten. Unfortunately, it is probably impossible to resolve this question in any decisive way.

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[75] Council of Economic Advisers, op. cit., p. 208.

The Contrast between World War II and the Aftermath of Nuclear War

In general, and in comparison with experience in other countries, the performance of the American system of economic controls in World War II was impressive.[76] However, in assessing the relevance of that experience to the problems of economic organization in the aftermath of a nuclear war, the major distinctions between the two situations must be kept in mind. First, it must be remembered that the economy started from a position of depressed activity. It has been estimated that real gross national product could have been about 30% higher in 1940 if it had been pressed to the limits of available resources in the way the economy was pressed in 1944.[77] As a result, defense expenditures could be increased dramatically--by almost 180 billion dollars at 1964 prices between 1940 and 1944--without cutting into consumption. Real personal consumption expenditures actually rose about 10% from 1940 to 1944, although there was a 2% decline from 1941 to 1942.[78] Thus, the government was spared a full confrontation with the basic dilemma noted above by the fact that the economy was not operating under conditions of resource scarcity in its initial position. The task of shifting the composition of output would have been enormously more difficult, and the initial failures of the control mechanism would be a great deal more prominent in the record, if the task had actually been one of reducing the output of consumption goods to free resources for war production.

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[76] In particular, it was impressive in comparison with the German performance. Burton Klein has argued that it was in part the incompleteness of Germany's mobilization early in the war that made possible the rise in war production until very late in the war. See Burton H. Klein, Germany's Economic Preparations for War (Cambridge, Mass.: Harvard University Press, 1959).

[77] This result is based on the aggregative production function for "potential output" estimated by James W. Knowles, "The Potential Economic Growth in the United States," Study Paper No. 20, Study of Employment, Growth and Price Levels, Joint Economic Committee, Congress of the United States (Washington: Government Printing Office, 1960). Essentially the same result would be obtained from the "equivalent capital stock" potential output production functions estimated by Robert M. Solow, "Technical Progress, Capital Formation and Economic Growth," American Economic Review, LII, 2 (May, 1962), pp. 76-86.

[78] Council of Economic Advisors, op. cit., pp. 190-91.

Second, the special institutional devices of wartime controls were added to a set of institutions for guiding economic activity that were themselves completely intact. In contrast to the situation that would prevail after a nuclear war, the government did not have to concern itself with clarifying property rights, rebuilding organized markets, recreating a tax system, and so forth. If the government had used the pay-as-you-go system with the tax rates and amounts of deficit financing actually adopted, and foregone control entirely, the increase in war production would nevertheless have been large. If it had added price controls and rationing for consumer goods, and foregone direct controls over the composition of output, a still better result would have been obtained. To the extent that early control measures outside of the consumer goods field were ineffective, the foregoing is a reasonably good approximation to the actual course of events during the first year and a half of the war. Together with the presence of economic slack, the existence of a functioning set of economic institutions meant that the penalties for delay in achieving effective control policies were much less in the World War II situation than they would be during the reorganization phase.

Third, in comparison with the hypothetical future situation, the government possessed at the start of World War II relatively good information on the supplies of productive resources of various kinds and on the amount of production of various materials that might be forthcoming. The initial situation was one of proximate equilibrium, and the changes to be made in the patterns of economic activity were to be the government's own doing. Prewar prices, or prices prevailing early in the mobilization, could be taken as the initial basis for price control, and adjustments considered subsequently as the effects of the mobilization effort spread through the economy. Finally, the government itself possessed a monopoly of the information and expertise bearing on the question of what output mix should be produced--it alone could choose, for example, among the various mixes of aircraft, tanks and landing craft that it might be possible to produce. All of these considerations suggest that the government possessed much better information on the actual, possible and desired courses of economic events in the early months of the war than it would in the early months of the reorganization period. In spite of improvements in the quantity and quality of economic statistics, and in

spite of substantial efforts to prepare to meet the information needs with damage assessment systems, PARM calculations and other methods, it seems likely that the enormous distortions produced by the war and the probable deficiencies of the systems for acquiring economic information post-attack will leave the political authorities with a very inadequate information base for detailed control.

Lastly, the significant difference between the objective of maximum war production and the objective of economic viability should be noted. In wartime, the output withheld from current consumption is simply a dead loss; it yields nothing in increased future consumption either during the emergency or after it. In the reorganization phase, on the other hand, the primary claim on output competing with current consumption would be investment to achieve viability, and, ultimately to support recuperation. In this respect, the problem after a nuclear war would be akin to the problem of achieving a more rapid rate of economic growth. Prior to the achievement of viability, however, the economic growth problem would be of a very peculiar sort. The elimination of the most severe bottlenecks would offer a set of spectacularly productive investment opportunities, but the penalties for a failure to increase output at a rapid rate would be equally spectacular. Hence, it would be quite remarkable if the only promising tools of economic policy during the reorganization phase were ones that are familiar either from the wartime or economic development context. Some prescriptions that are more specific to the disease are suggested below.

Designing the Tools of Economic Control: Issues

Private Interests as an Obstacle to Effective Control. In any conflict situation, it is extremely helpful to know the strategy one's opponent will follow before choosing one's own. In the conflict between the government official trying to shape the course of economic events and the individual economic agent trying to advance his private economic interest, the official operates under a serious handicap. So long as he is committed to the rule of law, and hence cannot punish behavior he does not proscribe, he must openly define the limits of acceptable behavior. The individual

on whom the control impinges is then free to pursue his own interest within those limits--and in doing so he may well prove to be highly imaginative in devising formally acceptable modes of behavior that the official would have forbidden if he had thought of them. Of course, the official may be free to change the regulations--but only after the undesired behavior has gone on for some period of time. Even if the official is free to decide ex post that certain behavior was criminally subversive of the intent of the regulations, and to punish accordingly, he still operates under a handicap to the extent that his means for detecting such behavior are well known to the private individual. The individual is at least free to pursue his own interests within the range of behavior that is unacceptable to the official but not detectably so. With enough spies and secret police, the official may finally succeed in making the desire to please him the paramount concern in the individual's mind--but he had best be wary of the extent to which the private interests of the spies and the secret police coincide with his objectives.

The foregoing is, no doubt, an extreme characterization of the difficulties confronting the official aspiring to control economic events. Within limits, he may be able to secure compliance for his directives on the basis of generalized respect for the law and the legitimacy of his authority. Within wider limits, regulations will be complied with if their objective is widely known and shared and their fairness and probable efficacy generally conceded. He can dispense with the spies and the secret police if violations by one individual can be detected by others, and if the private interests or values of the others lead them to report the violation. He can deter many prospective violators by only occasional successes of detection and punishment, and this way achieve a high enough rate of compliance to make his policies effective. Finally, he will very likely meet with success if the damage his controls inflict on private interests--either directly or in relation to opportunity--is not too severe.

Desirability of Voluntary Compliance. The historical record of attempts at economic control suggests strongly that success rests on voluntary compliance and only secondarily on the ability of the official to anticipate, detect and punish

the various forms of undesired behavior. Over a wide range of commodities, price controls may be evaded (or five year plan output targets spuriously fulfilled) by allowing the quality of output to deteriorate, or by adjusting the composition of output toward the most profitable items. If enforcement is sufficiently tight or public support of the controls sufficiently strong to limit overt black market activities, various forms of barter may arise.[79] For example, wage controls may be evaded by improvements in working conditions, subsidization of the cafeteria, or by condoning pilferage of supplies.[80] Individuals who possess supplies of commodities whose prices are controlled at levels below equilibrium may demand that buyers also purchase some uncontrolled commodity from them--at a price far above its true value. Where the rewards are sufficiently high, entirely illegal systems of production and distribution may persist in the face of quite intensive efforts to suppress them--as the continued existence of the narcotics traffic illustrates.

Consideration of the various factors making for voluntary compliance leads to the conclusion that the extent of such compliance interacts with the overall performance of the control system. If flagrant violations go unpunished, if the behavior demanded by the system seems irrelevant or counterproductive in relation to its stated goals, if the temptations offered seem so large that it is difficult to believe that others are not yielding to them, or if the system simply appears incapable of accomplishing its objectives, even the most public spirited citizen is likely to consider himself freed from the formal constraints of the system. He may yield at first only to the extent of adopting illegal means to further the general objectives of the control system--for example, by engaging in illegal transactions to obtain supplies for the production of items whose production is being encouraged by the authorities. But an increase in this sort of illegal behavior will further degrade

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[79] See H. Mendershausen, "Prices, Money and the Distribution of Goods in Postwar Germany," American Economic Review, XXXIX, 3 (June, 1949), pp. 646-672, for a discussion of this pattern in postwar Germany, when "black market" activities were considered disreputable by the bulk of the population, but bilateral exchange was not.

[80] Ibid., p. 657.

the general respect for the system as a whole, and, if it goes unpunished, make it increasingly difficult to determine precisely what behavior is forbidden. As a result, there will be an increasing tendency for individuals to resolve their doubts in favor of their private interests. Ultimately, the control system will have to be drastically revised, or abandoned, or it may persist as an encumbrance upon a basically laissez-faire system. The mere forms of control may have some political appeal, and the "operation" of the system will provide employment for many and opportunities for large incomes from extortion for a few.

Administrative Resources in Relation to Control Functions. In designing the system of economic controls, therefore, it is imperative that the prospective adequacy of administrative resources be considered in relation to the control functions undertaken. If detailed directives are issued on the basis of inadequate information, the recipient is likely to find them irrelevant to his situation. If he requests clarification or revision, and receives no answer because officials are swamped with such requests, he may conclude that the system is an obstacle to the achievement of national goals. If inadequate information on demand conditions leads to prices in some markets being controlled at levels wildly inconsistent with market forces, the disappearance of supplies into black market channels may make the official allocation system meaningless and force everyone into the black market. If the number of personnel available for the investigation and punishment of violations is hopelessly inadequate, the example of flagrant and profitable violations by some will lead others to follow. The system will not always perform in exact proportion to the adequacy of the administrative resources; if resources are too inadequate, the system will simply fail.

The attempt to achieve a reasonable reconciliation between estimates of what needs to be done in the way of economic control and estimates of what can be done should include an examination of alternative systems from the various points of view of the individuals whose behavior is to be influenced. Even a large and deliberate effort at such an examination is unlikely to identify all of the important modes of behavior that would appear if the system were in operation. In the

absence of such an effort, it is probable that the forces acting upon individuals and the alternatives open to them will be seriously miscalculated. Gross inconsistencies among different parts of the control system, leading to situations in which individuals must exert themselves strenuously to identify modes of behavior that are merely legal and productive, may escape detection if no attempt is made to "role play" an individual facing the system as a whole. It is particularly important to examine in advance the situation of the typical plant manager in various industries. How many different allocations and permits must he obtain in order to secure inputs for the production he wishes to carry out? How does it happen that he obtains either all of them or none of them? What happens if he cannot obtain the materials to which his allocations entitle him, or if he obtains materials of such inferior quality as to be unusable? What assures that he carries out the production for which he received allocations?

The possibility of conflict among different parts of the control system is intimately connected with the question of how much of the task of formulating production schedules is to be done centrally and how much left to individuals and to the workings of the market. If the government were to limit itself to an effort to suppress undesired activities, and abstained from the detailed planning of desired ones, it could concentrate its enforcement resources on one or two very simple forms of direct control. For example, the ability to deny manpower, or plant and equipment, or electric power, or transportation, would certainly suffice to suppress the production of most commodities, provided only that the government could detect violations. The necessity of simultaneous and coordinated control of a wide range of productive resources arises only if the government wishes to achieve a certain detailed composition of output (beyond specifying what shall not be produced). It may appear desirable to undertake detailed planning of the composition of output if the institutions of the private economy are likely to function so ineffectively as to result in a total output far below the technological limits. However, it cannot be seriously argued that complete central planning of

output in full detail, including quality specifications, is feasible at the plan formulation level, let alone enforceable.[81]

Compatibility between Levels of Control and Institutional Means for Resolving Residual Problems. This leads to a second imperative for sound design of the tools of direct control. The level of detail at which control will be exercised must be chosen in a way that is compatible with the institutional devices that will settle the details that the control system neglects. For example, if the central plans involve reference to some fairly aggregative commodity category--fractional horsepower electric motors--how are the producers of items in this category to determine the exact composition of output to produce? Lacking detailed directives, how do they allocate their limited resources among the competing demands of their various customers? Even if the prices of all the individual items are controlled, there will not in all likelihood be a matching of demands of their customers at these prices and their capacity to produce. If some prices are uncontrolled, or specifications are not fully detailed, the situation is even more obscure. If the producers choose in accordance with private profit calculations, they may neglect some customers whose demands are more urgent, in terms of national goals, than those they serve. If price controls are rigid, the neglected customer cannot meet even a fraction of his needs by offering a higher price. And if customers are free to bid, what assures that the results of the bidding process are themselves in accordance with national goals? This, clearly, is not a simple problem. If realistic solutions are not formulated in advance, the control system will tend in operation to evolve in the direction of more and more detailed planning. As it does so, the previously noted problem of compatibility between the functions undertaken and the resources available will tend to become more severe. Even if the initial functions were

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[81] If there was ever any doubt on this point, the recent controversy over reform of the planning system in Communist countries should by now have dispelled it. See, e.g., Leon Smolinski, "What Next in Soviet Planning?", Foreign Affairs XLII, 4 (July, 1964), p. 602-613.

reasonably compatible with the resources, the impossibility of confining the system to its initial functions will soon cause difficulties.

Two Alternatives of Economic Organization: Relative Centralization and Compulsion Versus Relative Decentralization and Private Incentives

It will be argued here that the range of possible forms of economic organization during the reorganization period is much more clearly dichotomized between relatively centralized systems depending on compulsion and relatively decentralized systems depending on private incentives than is normally the case. The reason for this lies in the magnitude of the task that must be performed after the attack if a decentralized, private property, market guided system is to function at all. An interim solution to the problems of clarifying property rights, reestablishing managerial authority in surviving firms, preventing mass insolvency, providing a functioning system of exchange, reconciling divergent expectations about the economic future and collecting taxes will be difficult to achieve. If an attempt to accomplish these things meets with only fragmentary success, the resources invested in the attempt will be essentially a total loss so far as the achievement of viability is concerned. The resulting fragments of a private ownership market economy are more likely to be a disruptive influence than a helpful supplement to the government's efforts at direct control.

Rather than foster the illusion that the system is one in which the pursuit of private economic interests is both legitimate and socially productive, the government should act to simplify its own problems of control. An immediate nationalization of all property except specified amounts of personal belongings should be decreed, and the individuals in de facto control of particular pieces of property should be declared responsible to the government for its utilization in the public interest. Such a move would effect enormous simplifications in the legal and administrative basis for the resumption of economic activity. Production and shipment directives could be issued immediately, without waiting even for the minor convenience of a system of prices and monetary exchange. The whole problem of economic organization would be reduced to two questions: (1) Would the

government be capable of formulating a set of detailed directives that would define a feasible path to economic viability? (2) If so, could it enforce discipline among its employees (the population) well enough to get the directives carried out? Later on, after the emergency had passed, the government could (if desired) sell the economy back into private hands, according to whatever set of distributional values then prevailed.

In any situation in which the achievement of economic viability was substantially in doubt, to attempt to reconstruct at an early date the forms of the traditional economic organization would be to invest in an elaborate showpiece with potentially disruptive symbolic values--a luxury that could not be afforded. The effort should not be made unless a high return on the investment is anticipated. While the returns on a restoration of the traditional forms might be high in terms of a sense of ideological continuity, returns in economic performance could be expected only if a large part of the substance of the traditional system were present as well. This means that private individuals, guided in large part by their assessments of their private economic interests, would have to be entrusted with much of the task of determining the course of economic events. The advantages of a private ownership market economy lie in its flexibility, its ability to call forth a high level of effort devoted to economic calculation, and, most of all, in its ability to dispense with a central compilation of all relevant economic information--not in its docility under comprehensive central control. To preserve the forms of such a system when imposing supplementary central control is one thing; to construct the forms when imposing comprehensive central control is quite another.

The principal drawback of the centralized "disaster socialism" system is that it would function well only if an enormous central bureaucracy happened to survive the attack. As noted above, it would be wildly unrealistic to assume full centralization of economic decision making, and one may concede a certain amount of intelligent individual initiative to the newly appointed government managers of productive units. But perhaps the Soviet Union may be taken as a reasonable model of relatively complete central planning. There, it has recently been stated, "over ten million specialized officials are engaged in collecting and processing economic

data".[82] Presumably, not all of these are located in Moscow. To cite a standard of comparison at the other extreme, the civilian employees of the federal government located in Washington in 1943 numbered about 285,000. In any case, to assure the survival of a central bureaucracy of the required size would involve the construction of enormous underground facilities, and, if the system were to be secure against surprise attack, continuous manning of these facilities. The alternative of attempting to assemble the control system after the attack does not seem realistic, in view of the timetable of the viability problem.

The timely restoration of a private ownership market economy, its supporting institutions, and the traditional mechanisms of government influence over the economy would also require extensive pre-attack preparations and post-attack activity by the government. It is argued below that it would be much easier to assure the survival of the capabilities for accomplishing these tasks, essentially because no single administrative unit needs to be charged with very elaborate responsibilities toward the entire economy--at least, not by comparison with the alternative scheme. It may reasonably be doubted, however, whether the government could in fact provide the organizational basis for "business as usual". Several times as much doubt must therefore exist as to whether the government can both provide that basis and then override it with the devices of comprehensive direct control. To divide limited administrative forces against two such challenging objectives would be absurd.

Restoration of a Market Economy: Some Suggestions

What follows is a very brief description of some specific approaches to the problem of restoring a private ownership market economy in the aftermath of a nuclear attack and guiding it to the achievement of economic viability. It is emphasized that the task is large, but not, with advance preparation, infeasible. It is further emphasized that any surviving administrative capabilities of the Federal government not absorbed in the task of restoring the normal forms of economic

[82] Ibid., p. 607. (A Soviet source is cited)

organization could be productively utilized in "indicative" or "semi-directive" planning without the adoption of control techniques that would severely restrict the flexibility of the economy in a crisis.

Individual Property Rights and Property Management. The first and most crucial problem is whether there can be a reasonably quick clarification of the question of which individuals are free to operate or dispose of what property. This problem has several elements, but the most difficult one is the fact that an enormous number of business firms would find themselves bankrupt either because of the destruction of real property or the destruction of their debtors or of the evidence of the debts. An imaginative tool for coping with this problem has been developed by the Federal Reserve Board. Under this proposal, an Asset Validation and Equalization Corporation (AVEC) would be set up to assure the paper solvency of the economy. Essentially, AVEC would issue bonds of indefinite maturity and against any reasonable evidence of a previously existing asset that had been destroyed or was currently inaccessible. Thus, the value of destroyed or inaccessible assets in each firm's balance sheet is simply replaced by an equal value in AVEC bonds. Since AVEC would not pay out any money until the bonds matured, this vast infusion of paper wealth would not by itself cause an inflation problem. If the Federal Reserve System is prepared with a line of succession to the role of central monetary authority, there would be no reason why the identical line should not serve for AVEC headquarters. Furthermore, local commercial banks could be prepared to begin to carry out this operation at the earliest possible date.

The AVEC bonds solve the balance sheet aspect of the solvency problem, but they do not solve the liquidity aspect. For this purpose, a rudimentary credit control scheme would be required. Banks should make loans against the collateral of AVEC bonds to the extent necessary to permit firms to meet their previously incurred obligations as they came due. But they should apply more rigid standards to requests for credit to finance new operations.

The next obvious problem is to determine who would manage the firms whose solvency would be thus assured. For the larger corporations, the advance

development of adequate emergency plans could be required. These should provide in particular for the independent operation of any particular plant in the event of the destruction or temporary isolation of central headquarters. Lines of succession should be formulated in advance at each location and for the firm as a whole. In the case of smaller firms, and of residential real estate, it might happen that all of the former owners and/or managers would be missing and presumed dead. Emergency Boards of Settlement might be established in each community, prepared to appoint receivers of such property pending clarification of ownership. If no such clarification were obtained within a reasonable time (depending on the urgency of permitting full use of the property) the Board could assign actual ownership in exchange for the assumption of a reasonable long term debt to the AVEC--with reasonableness judged by the extent to which other individuals are willing to take on the same obligation. In this way, the property left without owners would in the long run provide the partial basis for the retirement of AVEC bonds--the compensation for the owners left without property. The remainder of the compensation would, however, have to be financed by other means.

As the earlier discussion in this section suggests, the chief drawback of the basic proposal to allow private profit calculations to guide economic activity is that high profits might provide the basis for large amounts of "technologically" unnecessary consumption. This is, in part, an inescapable price of this sort of system. However, a substantial reduction in this price could be obtained by the relatively simple device of prohibiting the payment of corporate dividends for the duration of the emergency. Furthermore, ceilings on the salaries of corporate managements should be imposed at fairly austere levels. But steps might be taken to assure that executives were generously provided with stock options exercisable after the payment of dividends again became legal. These controls might be evaded, but equally attractive opportunities would exist if the executives were technically government employees. To the extent that the controls are effective, they should promote careful attention to the productive reinvestment of profits.

Reestablishment of Monetary System. Next to the clarification of property rights, the most urgent step toward the restoration of a privately managed economy would be the reestablishment of a functioning monetary system. This problem is intimately connected with that of solvency and clarification of property rights, and also with the problem of real finance of recovery--of how consumption is to be restrained and output is to be diverted into investment in large enough amounts. Assuming that the AVEC or some similar device can at least assure the solvency of the banking system, the main questions remaining are (a) whether inflation would be resisted or encouraged, and (b) the timing and nature of currency reform, if any.

Although rapid inflation is generally considered to be something that should be avoided, it does offer a crude but probably quite effective means for freeing the private economy from the depressing influence of past obligations unrelated to current reality, and without any substantial change in legal forms or necessity for institutional innovations. If the value of money were allowed or encouraged to decline by a factor of ten in the first six months after the attack, relatively few of the surviving firms or individuals would have much trouble in meeting financial obligations. Thus, in the absence of adequate pre-attack preparations to carry through the AVEC proposal or some similar concept, a program of solvency through inflation should be given serious consideration. To be fully effective, such a program should include a temporary moratorium on all debts incurred pre-attack (to allow time for the debts to be made meaningless), and a comprehensive subordination of pre-attack to post-attack obligations (meaning that the large nominal claims of post-attack creditors would be senior to the small ones of the pre-attack creditors in any bankruptcy proceeding). In addition, some devices to allow relief from the performance in real terms of very long term pre-attack contracts should probably be developed--but the depressing effects of failure to do so would probably not be nearly so serious as those of a failure to provide a form of relief from obligations of fixed monetary value.

A first objection to this scheme is its obvious inequity between net creditors and net debtors. However, it must be remembered that the haphazard patterns

of destruction of wealth are already a cause of tremendous inequity, and the two sources of inequity may tend to cancel out--at least, they are not simply additive. Unless there is a reasonable prospect of being able to rectify the inequities of the war itself, the additional inequities from the inflation probably are of little moment. Without adequate advance planning, there will be no such prospect. A second objection is that the scheme will be counterproductive because the monetary exchange system will break down in a sudden flight from the currency. This prediction cannot be defended on the basis of the historical evidence, which is enormously persuasive of the resiliency of monetary exchange under inflationary conditions. The tendency toward a barter economy in Germany after World War II, for example, was apparently produced not by lack of confidence in the currency, but by the irrelevance of the currency in a system encumbered by rationing and other direct controls.[83] The lesson from the great hyperinflations is that prices did not simply explode when the rate of price increase reached 50% a month and more, but tended to rise mainly in response to the rate at which the government introduced new money into the system.[84] Thus, the evidence suggests that the government could promote solvency and obtain the resources it needed in the emergency by "resort to the printing press", with considerable confidence that the price level would stabilize and the system function normally whenever the press was stopped.

A currency reform could either be a part of an alternative to the inflation program, if adopted early, or a supplement to it, if adopted late. If adopted early, it would offer the considerable advantage of an opportunity to rectify the fortuitous distribution of access to liquid assets and thus relieve the tendency toward an extremely unequal distribution of consumption in the early time period. Access to purchasing power could be rigidly controlled by the terms and time schedules under which conversion of old money into new would be allowed. If pursued vigorously enough, it should make it possible to dispense with rationing of consumer goods at

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[83] See Mendershausen, op. cit., p. 655.

[84] See Phillip Cagan, "The Monetary Dynamics of Hyperinflation," in Studies in the Quantity Theory of Money, Milton Friedman, ed., (Chicago: The University of Chicago Press, 1956), pp. 25-117.

an early date in the reorganization phase. If adopted late, it would at least make it possible to mitigate the inequalities produced by the inflation, if not the inequities. This, of course, would be accomplished by a progressive system of conversion rates. It would also contribute to expectations of future stability by restoring the general level of prices to normal.

Command over Resources for Investment. The next question is that of real finance, i.e., of providing adequate command over resources to those who will use it for investment for viability and other essential purposes. Three suggestions in this area have already been advanced. First, if the inflation program is adopted, the inflation will operate as a real tax on holding money--the government obtains 100% of the first use of the new money it creates. A rapid expansion of bank loans to finance recovery investments, supported by the Federal Reserve and perhaps directed into desired channels by appropriate credit controls, would allow the government to finance private investment activity by inflation without becoming more directly involved in the determination of the investment program. Second, the temporary prohibition of corporate dividends would make corporate profits entirely available for investment. This would not necessarily foster an undesirable distribution of investment, since firms would be free to invest in other firms. Under the assumed conditions of labor surplus, this should be a very powerful device for promoting investment. Third, if a currency reform were adopted early, favorable conversion opportunities could be offered to firms undertaking desired investment programs.

If the foregoing measures were inadequate, a revised version of the World War II rationing and savings bond scheme could be adopted. This would involve the control of the level of money wages, but would allow firms to compete for labor by offering additional payment in the form of recovery bonds, which they would purchase at par from the government. The bonds might be of relatively short maturity, appropriate to the length of the reorganization phase--perhaps two to five years. If fears of future price increases made them unattractive, they could be "purchasing power" bonds, with nominal value tied to some price index. (This device, however,

should be used very conservatively.) Finally, to enhance their attractiveness further, they could be made fully negotiable. The price of the bonds would be determined in the short run by the general willingness to abstain from present consumption--but since the government would not redeem the bonds before maturity, the aggregate level of consumption would be restrained by the control of money wages. Unlike the World War II system, rationing of consumer goods would not be among the forces promoting the sale of bonds. And the proposal reflects the fact that, in contrast to the World War II situation, it would be realistic to offer real rewards for abstaining from current consumption.[85]

Some Other Governmental Influences on a Private Ownership Economy, Short of Full-Scale Direct Controls. The foregoing suggestions indicate how the government could act to restore a private ownership market economy, and to encourage a high level and generally desirable pattern of investment, without becoming involved in the detailed planning of the composition of output. Since, in contrast to the World War II situation, the government would have no important monopoly of detailed information bearing on the desired future composition of output, it could be argued that the government should confine itself to the foregoing functions. There remain, however, a great many ways in which the government could influence the composition of output in more detail without significantly encumbering the economy with direct controls. To the extent that its information systems provided it with information on the overall course of economic events that would not automatically be reflected in market prices, the government could usefully supplement the market forces shaping the composition of output.

First, it could engage in "indicative" or "semi-directive" planning. That is, it could calculate, in as much detail as possible, a desired path to economic viability. It could then seek to bring this result about, not by detailed control, but by focusing expectations, convincing large firms of the profitability of acting in accordance with the plan, and a limited use of credit controls and other more direct

[85] Aside from this feature, the proposal is very much like an expenditure ration.

tools.[86] In particular, it should certainly make the gross decisions on the geographical pattern of reconstruction, deciding which regions should be relied upon and which held back or written off. The market lacks an adequate mechanism for assuring that private decisions are adequately coordinated in such large matters. Also, it should seek to make up for the deficiencies, noted in Section II, in the market's ability to coordinate long run plans. In part, this might be done by simply forecasting future supply and demand conditions on a month by month basis; in addition, some expansion of future markets might be encouraged by government action, and the government itself might participate in the markets.

A promising area for direct government controls is transportation, electric power and the other regulated industries. Indeed, if steps are not taken to improve the performance of the regulatory function in the post-attack context, the inflexibilities of present methods of regulation might be a significant drag on the system as a whole. In cases where resources were being devoted to outrageously unproductive purposes, the government might suppress such activities by a discriminatory increase in utilities rates or by outright prohibition--but if other control functions are performed well, this should not be necessary very often. In developing improved methods for pricing and allocation of these services in the emergency, some consideration should be given to the feasibility of making a certain amount of capacity available to private individuals and firms on a completely free market basis--essentially by periodic auctions. This would provide a legal outlet for the most severe pressures operating against the schedule of controlled rates and allocation criteria, and might therefore tend to protect the control system from these pressures. In addition, it would serve a useful information function by revealing what sort of profitable activity the system was prohibiting.

The Alternative to Viability

As a conclusion to this discussion of the problems of economic organization for the achievement of viability, mention will be made once again of the organizational influences on the level of subsistence consumption. It would be unrealistic

[86] This is essentially economic planning on the present French model.

to assume that the principal alternative to viability is more or less simultaneous starvation of the entire population. Failure means, by definition, the occurrence of a situation so drastic as to produce a rate of population loss of the general order of magnitude of that suffered in the war itself. But, in all probability, some of the survivors would ultimately reconstitute some sort of viable economy. The question of which survivors would actually survive in the long run, and the nature of their political and economic organization, is related to the problem of the strains on the system of political and economic control that would arise as consumption declined to a critical level. It is likely that the first form of withdrawal from the system to occur would not be starvation, but the refusal, by individuals or political units, to comply voluntarily with the economic controls. These might be the individuals, or political units, that were relatively well off, but were suffering increased deprivation as the attempt was made to enforce greater equality to bring the entire population through the emergency. Such a withdrawal is even more likely to produce disastrous results than one by the least fortunate elements of the population, for the resources withdrawn would be larger. Thus, the alternative to viability is probably not the complete starvation of the population, but large scale starvation coupled with the loss of national unity and change in the forms of political and economic organization.

V. The Recuperation Phase

The successful achievement of economic viability would mark the end of the period in which recovery goals were largely the corollaries of dire necessities. Barring the appearance of important and unfavorable long run changes in the natural environment, large outbreaks of disease, or new man-made disasters, there should be no difficulty in maintaining viability if production levels adequate to meet essential current needs and maintain productive facilities were once achieved. Indeed, it is argued below that there is every likelihood that the economy would quickly attain a level of output large enough to provide a substantial margin of safety and make any relapse into nonviability extremely unlikely. There would soon appear, therefore,

a substantial range of technologically available alternatives from which, by various institutional mechanisms, the society would "choose" its path to "full recovery".

At this point in the discussion, the various ambiguities in the recovery concept noted in Section I become salient, and the particular hierarchy of objectives explicitly assumed there is inadequate to structure the analysis of a situation in which the highest priority objectives are assumed to be attained. Whether pre-attack output levels would be regained quickly, slowly or never is, in large part, a question about political decisions in the post-attack society, and to answer it one would have to predict the main features of the post-attack equivalent of the recent discussion of the rate of economic growth in the United States. Similarly, discussion of the forms of economic organization can no longer be confined to the technical merits of alternative means to fairly well defined ends, but must include reference to the values and ideologies that might prevail in the post-attack situation. Furthermore, these predictions of post-attack political events could hardly be unconditional, but would have to vary over an extremely wide range of possibilities in terms of the size and character of the attack, the heritage of institutions, distributions of wealth and income and so forth from the earlier phases of recovery, and--of great importance--the international political and military environment. Such a compounding of speculative predictions hardly seems fruitful, and the discussion here does not purport to relate to what would happen in the recuperation phase, but only to the gross features of what could happen, i.e., to the range of choice the society would face.

Recuperation Time

If the view put forward in the preceding section of the requirements for viability is approximately correct, the per capita gross national product just consistent with viability is on the order of a fourth to a third of the levels of the early 1960's. "Full recovery" in the specific and narrow sense of GNP per capita would thus require, with a constant population, an increase of GNP by a factor of three or four over the level required for viability. If the concept of a level of output just consistent with viability is taken literally, then it is possible in principle for the

economy to remain stuck forever at the margin of viability, unable to produce that slight increment of output which, if invested in additional capacity, would provide the basis for a cumulative expansion of output. It is conceivable also that the economy might be above the margin initially by such a tiny amount that the expansion of output would be exceedingly slow, and many decades or centuries might be required for recovery to occur. But it will be shown here that these theoretical possibilities are very unlikely to materialize. So far as strictly technological considerations are concerned, the margin of viability is a highly unstable equilibrium position for the economy. If viability were achieved at all, it would almost certainly be achieved with enough "room to spare" to make full recovery possible in two decades or less.

To develop the basis for this generalization, consider first the opportunities for a rapid expansion of output that would exist when the economy had just achieved viability. Severe imbalances would still loom large in the economic picture. In some industries and areas, output would be pressed to the limits of the capacity of workers, equipment and supporting utilities systems; elsewhere, productive resources would be idle or severely under-utilized for want of some crucial complementary input. This is only to recast the earlier conclusion that it is the possibility of unbreakable bottlenecks in key sectors rather than an overall deficiency of productive capacity that poses the main threat of economic collapse. To achieve viability, it would not be necessary to overcome these difficulties completely and restore the economy to balance, but only to overcome them to the point of making it possible to meet current needs out of current production. Any output that could be devoted to the further alleviation of imbalances--for example, to the construction of another petroleum refinery beyond those just required to support essential consumption--would yield a high return, since it would make possible the utilization of other capacity already in existence--for example, the utilization of surviving tractors, trucks and diesel locomotives standing idle for want of fuel.

Under these circumstances, a dollar invested in plant and equipment of the appropriate type may yield a continuing flow of additional output of several dollars per year. Furthermore, the more pessimistically one assesses the possibilities of effective utilization of surviving capacity, the more optimistically one

must assess the productivity of new investment. If the interdependence of the economy means that for every machine destroyed, another will stand idle, then it also means that for every new machine built, two will come into production. Thus, given the achievement of viability and the possibility of a small amount of net investment, different estimates of the consequences of interdependence quickly converge on the same conclusion--namely, something very close to full utilization of surviving capacity.[87]

Recuperation Time: A Simple Model of Recuperation Possibilities. A simple model of recuperation possibilities will now serve to indicate the extent to which recuperation time estimates in excess of two decades are implausible. Assume for the time being that the viable economy can produce an output in the same proportion to the value of its surviving physical capital in the forms of plant, equipment, roads, etc., as obtained between the pre-attack output and the pre-attack capital. This means that the higher survival rate of the labor force in relation to physical capital in various forms is assumed to compensate for the inappropriateness in the composition of the stock of physical capital. Assume further that this same ratio will prevail until recuperation is complete, at which point the pre-attack ratio between labor supply and physical capital will be restored. For simplicity, the discussion will proceed on the assumption that all of the labor force survives; since it relates essentially to per capita quantities of output and capacity, this is no restriction. Letting Q denote output (gross national product at pre-attack prices), and K denote capacity (physical capital valued at pre-attack prices), the assumption is:

$$Q = b\,K$$

Assume, as in the simple model of the reorganization problem, that a proportion d of the stock of capital wears out and must be replaced in each time period. Let A denote the total demands that must be satisfied in order to maintain viability,

[87] This assumes that useful conversion of almost any type of capacity is possible with a small amount of supplementary investment.

except for the replacement of worn out capital. Then the capital $\bar{K}$ required for viability satisfies

$$b\bar{K} = A + d\bar{K} \quad \text{or} \quad \bar{K} = \frac{1}{b-d} A$$

Assume that when the economy is viable the amount of output devoted to gross investment, I, is equal to the depreciation on the required capital $\bar{K}$ plus a certain proportion, s, of the excess of actual output over that required for viability:

$$I = d\bar{K} + s\ (b K - b\bar{K})$$

The stock of capital in one year is the same as that in the previous year, less depreciation and plus gross investment:

$$K_{t+1} = K_t - d K_t + I_t$$

or, substituting for I_t,

$$K_{t+1} = (1-d) K_t + d\bar{K} + s\ b\ (K_t - \bar{K})$$

$$K_{t+1} = (1+s\ b\ -d) K_t - (s\ b\ -\ d)\ \bar{K}$$

This is a first order difference equation in K. If K_o is the initial capital stock, the solution of the equation gives K_t as the following function of $\bar{K}$, K_o and t:

$$K_t = \bar{K} + (1 + s\ b\ -\ d)^t\ (K_o - \bar{K})$$

The initial stock K_o is to be regarded as the level of capital that can be achieved after all surviving inventories are drawn down to the minimum levels required to "fill the pipelines" and keep the productive machine functioning. If the economy achieves viability with no inventories to spare, then $K_o = \bar{K}$ and the system remains at $\bar{K}$. If it does have inventories to spare, then the amount of "excess capital" can grow subsequently at the rate s b-d per year. If the pre-attack capacity was K', then recuperation time, T, satisfies:

$$K' = \bar{K} + (1 + s\ b\text{-}d)^T\ (K_o - \bar{K})$$

This gives

$$\frac{K' - K}{K_o - \bar{K}} = (1 + s\,b\text{-}d)^T$$

Dividing numerator and denominator on the left hand side by $\bar{K}$, and letting $r' = \frac{K'}{\bar{K}} - 1$ and $r_o = \frac{K_o}{\bar{K}} - 1$, we have

$$\frac{r'}{r_o} = (1 + s\,b\text{-}d)^T$$

Taking logarithms,

$$\log r' - \log r_o = T \log (1 + b - d)$$

Or,

$$T = \frac{\log r' - \log r_o}{\log (1 + s\,b - d)}$$

If, as assumed above, K' exceeds $\bar{K}$ by a factor of three or four, then r' is two or three. The generalization offered earlier may now be rephrased as follows: For plausible values of the quantity $s\,b - d$, only very small values of r_o will lead to a value of T as large as 20 years.

The problem remaining is to determine the range of plausible values of $s\,b - d$. In 1960, the value of the stock of business owned plant and equipment at 1954 prices was a little over $650 billion.[88] The actual output produced with this capacity, "business GNP", was about $345 billion (1954 dollars). It is estimated, however, that with fully intensive utilization of capacity, corresponding to World War II utilization, the output could have been about 28% higher, or about $440 billion.[89] Thus, the value of b, output per dollar's worth of capital, would be about .67. Both the capital figure and the output figure are, however, confined

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[88]This is based on unpublished capital stock figures from the Council of Economic Advisers--the same data from which Solow's potential output production functions were estimated. (Op. cit.)

[89]The $345 billion figure is the business GNP figure used by Solow (Op. cit.). The higher figure is that given by Solow's "J_3" equivalent capital stock production function estimate, evaluated at a conventional unemployment rate of 1.0%.

to the business sector. They do not reflect the national product originating in government, households, or the services of houses, nor the corresponding buildings, equipment and residential structures. These account for about a fifth of the ordinary GNP, but a considerably larger fraction of the capital stock. Neither are business inventories allowed for in the capital stock figure, at least some of which are required for the smooth operation of the productive process. However, allowance for these omissions would not reduce b below .4. As for depreciation rate, a value of .04 would be on the high side. The average service life of equipment has been estimated at 17 years and that of plant at 50, and plant accounts for more than half of the total.[90] Furthermore, the average age of the nonbusiness portion of the stock would be more like that for structures.

If the condition for the continuing availability of the labor supply is actually that a certain level of per capita consumption be attained, then there would seem to be no reason why any increment of output above that required for viability should not be devoted entirely to capital formation--i.e., s - 1. Certainly, this would be the conclusion if physiological limits alone were considered. But the problem of defining the boundary between the technological and organizational determinants of labor supply arises once again. It may be that the various nonphysiological mechanisms that might reduce labor supply would be brought into play by a failure to satisfy aspirations for rising consumption standards. Also, the problem of devising taxation or incentive schemes that would produce a very low rate of consumption out of increments to output is a very difficult one. As a more or less arbitrary allowance for these considerations, assume that a value of s of .75 can be enforced. The resulting value of s b - d is then (.75) (.4) - (.04) = .26. For the sake of mitigating the spurious impression of accuracy, round to the nearest .05 and take .25 as a reasonable conservative approximation to the attainable value of s b - d.

Now take r' = 3 as the largest value of r' that might be considered reasonable on the basis of the foregoing analysis of the conditions for viability. Then the formula for recuperation time as a function of r_o becomes:

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[90] See James W. Knowles, "The Potential Economic Growth in the United States," (op. cit.) pp. 21-22. The same service life figures were used in arriving at the capital stock estimates mentioned above.

$$T = \frac{\log (3) - \log r_o}{\log (1.25)}$$

Taking logarithms to the base ten,

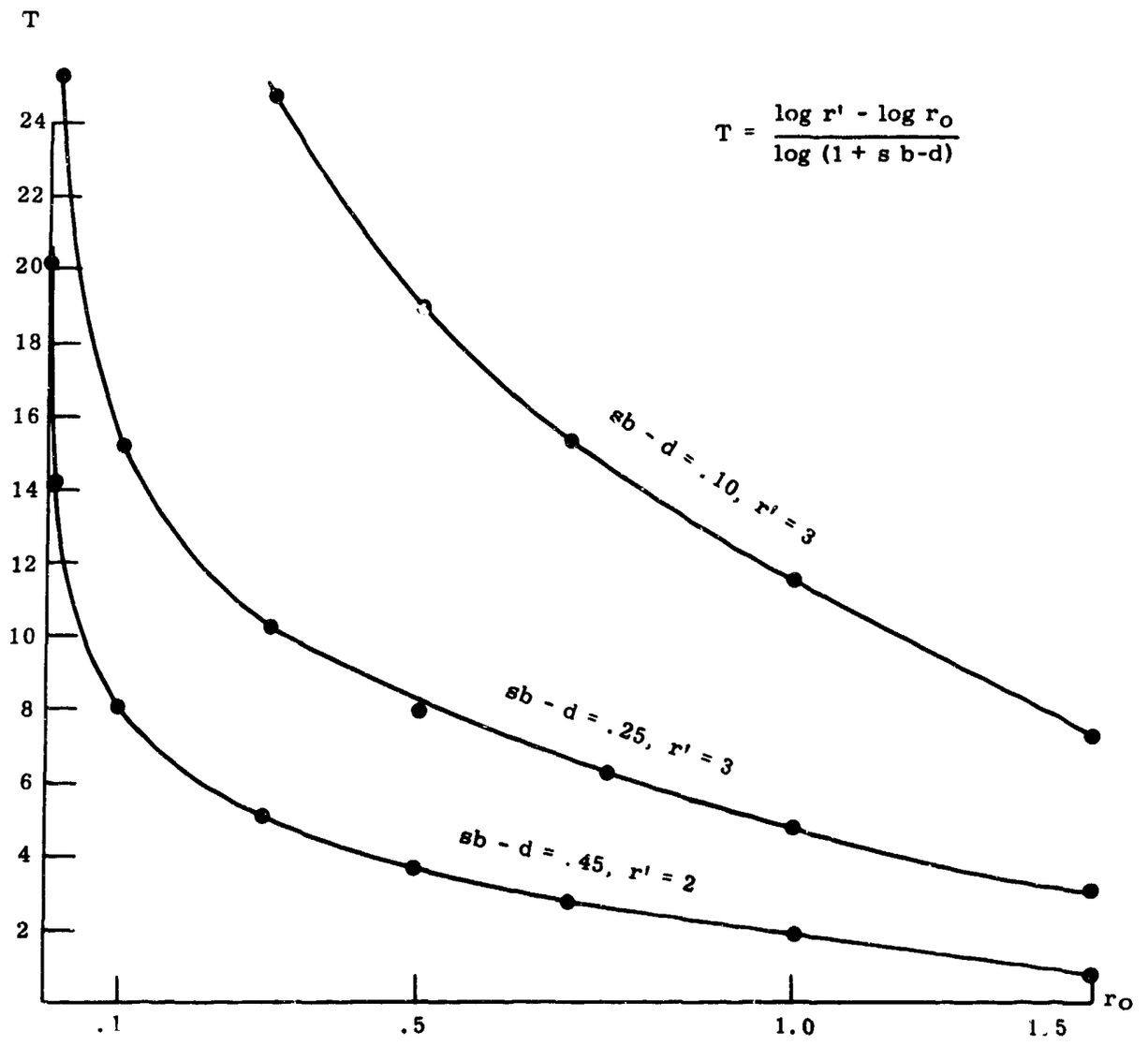
$$T = 4.92 - (10.32) \log r_o$$

This relationship between T and r_o is plotted in Figure IV-2, p. 443. It yields a T of twenty years for $r_o = .04$ -- i.e., if the economy can produce an output 4% above that required for viability by the time that surviving inventories have been run down to the minimum levels consistent with efficient production, then it is technologically feasible to achieve a factor of four increase in output and capital stock within twenty years. If $r_o = .10$, recuperation will take just over fifteen years, and if $r_o = .5$, it will take eight years. Even if $r_o = .01$, a situation in which the economy comes extremely close to failure to achieve viability, the indicated recuperation time is a quarter century. Thus, the line between success and failure in achieving viability is very little different from the line between success or failure in recuperating within two decades--if the society "chooses" to recuperate at that rate. Or, rephrasing the conclusion once again, to doubt the feasibility of recuperation in two decades is essentially to doubt the feasibility of achieving viability--the zone between "collapse" outcomes and "recuperation in two decades" outcomes is too narrow to be interesting.

A more realistic interpretation of this mode would involve regarding K_o as the "effective" initial capital stock, recognizing the probability that some of the surviving capital would be unutilized or very inefficiently utilized early in the recuperation phase. Then, of course, the actual destruction of physical capital must be smaller than previously assumed if viability is to be achieved. As noted previously, the other side of this coin is that the payoff to investment in the early stages of the recuperation effort will be extremely high. Values of b of one or more might prevail for the first few years, and only after a considerable period would b fall to a value as low as .4. A similar argument applies to r': While a quarter or less of pre-attack consumption per capita might suffice for viability if the composition of that consumption were well adapted to the level, in fact, the surviving

Figure IV-2

RECUPERATION TIME AS A FUNCTION OF
INITIAL "EXCESS CAPITAL"



capacity will be such as to result in inefficiently "luxurious" ways of doing things. For example, transportation to and from work could be provided at much lower operating costs if mass transportation systems were available, but in fact, the surviving capital will be heavy on automobiles and light on buses and subways. Suppose, then, that $r' = 2$ is a more realistic value, and take $b = .67$ as a reasonable average value of b for the entire period. This, with previous values of s and d, gives $s\,b - d$ equal to about $.45$. The resulting formula for recuperation time is:

$$T = 1.87 - 6.21 \log r_o$$

This relationship is also plotted in Figure IV-2. It gives a recuperation time of two decades (actually, 20.5 years) for a value of r_o of $.001$ -- i.e., an excess of the initial capital over that required for viability of a tenth of one percent. To phrase this result in more meaningful terms, recall that the stock of business owned plant and equipment in 1960 was worth $650 billion at 1954 prices. Assuming full population survival, the amount of effective surviving capital required for viability (taking $r' = 2$) would be $216 billion, and $.001$ of this is $216 million, or roughly a dollar per person of extra capital stock. After a little over six years, the extra capital would have grown to only 2.16 billion, and in twelve and a half years to 21.6 billion. (The use of $b = .67$ is certainly conservative up to at least this point.) Then, in the remaining eight years, the same rate of percentage increase would finally produce significant results in absolute terms.

Thus, the more one emphasizes the high degree of interdependence of the economy, the imperfect adaptability of its plant and equipment, and the implied probability that some surviving capacity will be unusable and that consumption patterns will not be well adapted to the level of consumption, the more one strengthens the conclusion that the important issue is the feasibility of achieving viability. Given success in achieving viability, the feasibility of a restoration of pre-attack levels of per capita within two decades can hardly be in doubt, and recuperation times of 10 years or less are plausible. This relationship is entirely reasonable, for to emphasize the elements of inflexibility in a modern industrial economy is essentially to argue that it likely either to work well (recuperate quickly) or not at all (fail to achieve viability). The aggregative calculations just presented probably tend toward a significant <u>understatement</u> of this "brittleness" in the economy.

Of course, if s is so low that $s\,b - d$ is close to zero, recuperation may require a very long time even if r_o is fairly large. As indicated previously, prediction of the actual recuperation rate becomes in large part a problem of predicting government policies, which themselves would be influenced by their anticipated effects on the recuperation rate. Without advancing a definite prediction, one might reasonably speculate that the urgency of increases in consumption would appear very great for the first two or three years, and that fairly low values of s would result. During this period, however, the very high value of b would be a compensating influence tending to hold the value of $s\,b - d$ at a respectable level. A period of rising s and declining b might follow, resulting in an approximate constancy of $s\,b - d$. Finally, one might expect that s would decline toward more "normal" values (.20) as recuperation neared completion. The overall result, of course, would be a recuperation time considerably in excess of the minimum technologically feasible.

As a check on the reasonableness of the foregoing conclusions on recuperation time, it is of interest to compare the implied rates of economic growth with historical experience. When $r' = 3$, GNP increases by a factor of four during the recuperation period. For this to be accomplished in twenty years, the (geometric) average rate of increase must be about 7.2% per year. For $r' = 2$, the implied average rate is a little over 5.6%. Considered as rates per capita or per man year, these may be compared with the actual rate of 6.1% for Japan over the 1950-59 period, or 6.8% for West Germany in the period 1950-57. This rate was accomplished in Germany with an average of 20.6% of gross national product devoted to gross domestic fixed investment. After the severe "viability crisis" of 1946-47, per capita consumption was restored to 1938 levels in West Germany by 1954. Thus, the average rates of growth implied by the above analysis are by no means seriously out of line with historical experience. It might be objected that the Japanese and West German rates were not sustained for the long period assumed above, and that in any case the rates implied for the end of the recuperation period are higher than any that have been observed in advanced economies. But this may be countered by observing that the calculations above refer to technological maxima, and there is no evidence to indicate that rates of increase of output per capita on the

order of 15% per year would be infeasible at present in the United States if the share of gross investment in output were increased to something on the order of .5.[91]

Qualifications to This Analysis

Considered on its own terms, the foregoing discussion of recuperation is rather heavily slanted toward overestimation of the minimum time required for recuperation. In particular, if explicit account were taken of the effect of the changed capital-labor ratio on the productivity of capital, values of b higher than those considered above could be defended for the early part of the recuperation period even without any appeal to the existence of underutilized capital. Furthermore, no account has been taken of the possibility of incorporating the most modern technology in the new equipment put in place during the recuperation period, let alone of the possibility of further technological change during the recuperation period itself. The calculations have been based on the assumption that the capital stock would simply be reconstructed in its former composition. If these possibilities were admitted, the amount of investment required to restore output per capita to its previous level would be considerably smaller than that implied above, and the time required to accomplish this amount of investment would be correspondingly smaller.

Absolute Levels of Destruction. However, it is plain that these relatively crude calculations ignore some consequences of a nuclear war that could have important effects on recuperation time, and the conclusions must be qualified accordingly. The most important qualification has to do with the fact that the calculations relate entirely to the relative proportions of surviving capital and population or labor supply, as if the absolute level of destruction made no difference. Clearly, this sort of analysis cannot be pushed to the absurd point of claiming that a few thousand survivors scattered around the country would enjoy high standards of

[91] Besides which, the following rather plausible program also yields a less than two decade recuperation time: Let $r_o = .04$, and let $b = .67$ and $s\,b - d = .45$ for 7.5 years, at which point the average gross investment rate has risen to .30. Then hold the gross investment rate at that point and drop b to .4, resulting in an 8% growth rate. In 11.5 years, this gives full recovery.

living if they were equipped with twice as much plant and equipment per capita as the current average. The analysis is most relevant for cases in which the fraction of the population surviving is high, and the damage to the economy is severe--which is to say that it is relevant for cases in which extensive preparations to assure population survival have been carried out, but nothing has been done in the way of creating an "underground economy".

Absolute Levels and Patterns of Survivor Productivity. As the fraction of the population assumed to survive declines, there are several possible effects on the productivity of the survivors that should be noted. First, and most important, there is the possibility that the distribution of skills in the surviving labor force might be out of balance and unsuited to the needs of the economy. This effect is quite analogous to the possibility of inappropriate composition of the surviving stock of physical plant and equipment. And, as in that case, one assumes that there is a considerable degree of substitutability among workers with different degrees of training and experience, and that the consequences of the imbalance would become severe only if the imbalance were quite extreme. For example, if an attack were directed at petroleum refineries and succeeded to the point of destroying 95% of the capacity and killing the associated managers, engineers and production workers, then it would be reasonable to assume that the surviving petroleum labor force would contain a large enough pool of experience and skills to operate perhaps ten or fifteen per cent of the original capacity, with the help of inexperienced workers. Thus, during the reorganization period, the shortage of physical production facilities would be the chief problem, but further increases in output during recuperation might be constrained by the labor shortage. On the other hand, the total loss of the labor force in petroleum refining would pose very serious problems from the very start of the reorganization period. And, of course, if disproportionately heavy losses occur in very broadly defined skill groups, the possibilities for useful substitution are limited. The engineering talent needed to rebuild the petroleum industry might be found in, for example, the chemical industry. But if losses were very heavy in all categories of engineers, the theoretical possibilities of substitution among the categories become irrelevant.

Even if the distribution of loss of life over skill categories were random, the skill distribution among survivors would tend to be drastically different from the pre-attack distribution at levels of attack which inflicted very high percentage rates of overall population loss. In fact, if fallout protection were available, losses would be concentrated in those skill groups that concentrated in large cities. In particular, the managerial and technical elites of the nation would be hard hit, for these groups are concentrated in a few of the largest cities.[92] The disproportionate losses of capacity in manufacturing industry would be matched by disproportionate losses in the labor force in manufacturing--and labor force losses might be highly correlated with physical plant losses on an industry-by-industry basis as well. A detailed study of the probable patterns of population loss, the requirements for various skills, and the amounts of education and training required to obtain the skills would be needed if the extent of the possible drag on recuperation were to be estimated accurately. For the moment, it seems reasonable to assume that the drag would not be particularly important if overall population losses were less than a third of the population. Also, it should be noted that any defense measures which would effectively reduce the vulnerability of the populations of the largest cities would mitigate this problem considerably.

Changes in the Natural Environment. A second potentially depressing influence on the productivity of the survivors would be the changed natural environment of agricultural production. Some of the effects hypothesized in discussions of this problem might develop in a cumulative fashion for a period of several years unless checked by deliberate and massive efforts. It could happen that, after once achieving viability, the economy would be forced to devote an increasing proportion of its resources to the effort to bring erosion, floods and perhaps insect plagues, etc., under control. These difficulties would have to be of enormous scope to produce effects on agriculture so large as to affect seriously recuperation in the

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[92] See Margaret B. Rowan and Takuya Maruyama, The Concentration of Essential Personnel in American Cities, (Santa Monica, Calif.: The RAND Corporation, RM-1722, May, 1956).

economy as a whole. However, in the absence of quantitative evidence on the likely magnitude of these difficulties, the possibility that they would be large enough to have serious effects cannot be excluded.

Higher Transportation Costs. A third factor tending in the same direction would be the higher transportation costs associated with the post-attack distribution of population and productive facilities. Surviving productive facilities would be at greater average distance from suppliers and markets than they were before. Where previously there were ten plants distributed around the country, after the attack there might be three--and possibly three in the same general region. Where previously the facilities existed within a particular region to perform a sequence of operations on a given raw material, after the attack it might happen that the only surviving facilities for performing one operation in the sequence were located at a great distance, necessitating shipment back and forth. In the course of recuperation, these distortions would be partially eliminated. Again, it is difficult to estimate the implications for recuperation time, which obviously depend to a considerable extent on the details of attack. But, as in the case of agriculture, the low present share of transportation in total national product provides some basis for a belief that the effects could not be large at low levels of attack.

Survivor Disabilities. Lastly, the possible debilitating effects of the war upon the survivors should be mentioned. Radiation exposure, it is believed, has general life shortening effects in addition to such specific effects as increasing the incidence of leukemia.[93] To the extent that the implied increase in the death rate merely restrains population growth during the recuperation period, it probably hastens the attainment of pre-attack per capita standards. But if a generalized increase in illness and decline in strength were a facet of this deterioration of health, labor productivity would suffer. In addition, of course, survivors with disabling physical injuries or psychological traumas would not be in the labor force. From the point of view of the population as a whole, the presence of unproductive

[93] The Effects of Nuclear Weapons, op. cit., p. 599.

survivors is equivalent to another decline in productivity. Given the assumed conditions of high survival of labor relative to capital, there is little reason to suppose that recuperation would be much retarded by these factors in the early stages. If, however, the influence of these factors had not diminished substantially by the time that the capital stock was restored to its former proportion to the effective labor force, the retarding effect could be significant.

Summary. It is obvious that these considerations, and others that could be mentioned, completely overturn the conclusions of an analysis in per capita terms if the rate of population survival is low enough. The difference they might make in the range of 50% to 75% survival, where the assumption of success in achieving viability is more acceptable, is less clear. In particular, the seriousness of the threat to productivity in agriculture is difficult for an economist to judge. As for the other considerations, the pessimistic biases in the aggregative calculations seem at least as imposing so far as the feasibility of rapid recuperation is concerned.

Organizational Aspects of Recuperation

Assuming that the basic values of the recuperating society would be such as to make a general reversion to pre-attack modes of economic organization attractive, the last half of the recuperation phase would presumably see the dismantling of much of the special institutional apparatus required in the earlier emergency. This process might encounter some of the traditional obstacles to a cutback in government programs, but, where emergency economic controls are concerned, these obstacles have not in the past proved very hampering.

Of course, if the "disaster socialism" course were adopted during the reorganization phase, the dismantling process might include the major task of restoring the institutions of private ownership. Barring dramatic shifts in politico-economic values and ideologies, or dramatic improvements in the technology of central planning, a substantial restoration of those institutions seems likely even after a prolonged

bout of disaster socialism. The information flows and administrative apparatus required for central planning of details of output in agriculture, retail trade, personal services and much of manufacturing are so out of proportion to the conceivable gains from control as to make it virtually inconceivable that a n.tion without a strong ideological commitment to central control would persist in central control of these sectors if alternatives could be developed. In disposing of the nationalized property in these sectors, the government might begin by setting up firms with the formal structure of private enterprises, with assets valued realistically on the balance sheet, perhaps with the government's managers as minor stockholders, but with the government itself retaining a large majority of the stock. It could then cut large numbers of such firms loose from the direct control systems at one time, hopefully in such a way as to create reasonable competition in the sectors thus denationalized. After exercising its influence as controlling stockholder to prevent catastrophic behavior during the transition period, it could gradually dispose of the remainder of the stock in any one of several ways.

Whether the denationalization process would extend to the major manufacturing industries in which competition is currently weak, or to the regulated industries, is another matter. It is easy to imagine that the forms of economic organization would be permanently altered in the direction of the present Western European economies with large nationalized sectors. It is easy to imagine, too, that the power of the federal government would be permanently enhanced in other spheres of activity, relative to the power of state and local governments. On the other hand, it is quite possible to imagine the opposite. We are now well past the point of diminishing returns to conjecture.

It is, however, very tempting to conjecture that the disaster socialism system is a good deal less favorable to the ultimate restoration of an economy organized for the most part around the institution of private property than is the alternative system sketched earlier. Whether this means that it is less favorable to ultimate social recovery depends on the definition of recovery, and that is not a simple matter to settle.

VI. Conclusions

This essay has attempted to provide a structured view of the economic dimensions of societal recovery after nuclear war. In vast areas of the subject where the existing research is exceedingly thin and often lacking in a useful orientation, very crude empirical judgments and calculations have been employed in the attempt to generate a conceptual structure that will assist in the formulation of meaningful, important and relatively researchable propositions. It should go without saying that the judgments expressed are regarded as hypotheses that, hopefully, will provide a fruitful and reasonably coherent orientation for future research. Refinement, testing, and strenuous systematic criticism of these hypotheses are both possible and--if we want to comprehend the implications of our technological, political and military environment--desirable.

The main hypotheses may be summarized as follows: The most critical question about the economic consequences of nuclear war is whether economic viability can be achieved--whether production will recover to a level adequate to support the survivors before the grace period afforded by surviving inventories comes to an end. It will not be technologically feasible to achieve viability with a drastically more primitive division of labor, involving a large factor increase in the percentage of the population living on farms, unless perhaps this policy is deliberately adopted and prepared for. If the alternative of a major relocation of the surviving population is foreclosed, the levels of real gross national product per capita required for viability are certainly not below those characteristic of the early years of this century, and are probably more like those of 1933--i.e., a fourth to a third of present levels. It is assumed that any economic preparedness programs will be designed primarily to permit the effective use of surviving resources, and will not involve major efforts to increase aggregate resource survival. On this assumption, levels on the order of 2000 megatons (plus or minus 1000 megatons) on urban-industrial targets might well make the attainment of the required levels of GNP per capita infeasible within the first year or two after the attack--roughly the time that might be made available by preparedness programs of the indicated type. The most obvious potential cause of such a collapse would be an all out attack on

petroleum refineries, coupled with enough damage to transportation and to durable goods manufacturing to severely delay reconstruction. If, however, viability were successfully achieved, then it would probably be feasible to restore pre-attack levels of per capita GNP within two decades or less--barring drastic influences of a changed natural environment on agricultural productivity.

The question of the rate of recuperation that would or should occur and the related question of the eventual forms of economic organization must remain obscure in the absence of a reasonable basis for predicting the values, ideologies and political attitudes that would (or should) prevail in post-attack society. However, questions of economic organization in the survival and reorganization phases would presumably be generally regarded as questions about the technical performance of alternative systems in minimizing population losses. In the survival phase, the immediacy of the threats to population survival will place the task of effective and equitable distribution of existing stocks in the foreground, and in this situation the institutions that normally guide economic activity will play no role. With the passage of these immediate threats, a fairly clearcut choice must be made between a pattern of organization involving detailed central planning and one predicated on the restoration of private property, markets, and related institutions. Given sufficient advance thought, planning and preparations, either system could probably be made to work. However, the system based on the restoration of private property probably requires significantly less in the way of preparations, and is likely to be far superior if the survival of a large fraction of the Federal bureaucracy is in doubt. This does not mean, however, that the government should take a passive role as the economy moves toward viability. On the contrary, a wide variety of devices of economic control and influence could be developed that would usefully supplement the workings of the market.

Of the many unsettled questions of fact that bear on the validity of these hypotheses, none are more crucial than the set of related issues involving the organizational determinants of the level of subsistence consumption, the conditions for the breakdown of economic control systems, and the pressures and incentives that might lead individuals to take actions that would militate against the achievement of

a viable and unified national economy with the maximum possible surviving population. A fully satisfactory answer to these questions may not be attainable in the foreseeable future, but there is clearly an abundance of historical and other evidence that awaits interpretation with the proper combination of social science techniques.

Introduction to Chapter V

Howard R. Swearer's essay on local government in the United States and the Soviet Union under stress has a dual function in this collection of studies of the social dimensions of nuclear attack.

First, as a study of the dimensions of stress in administrative organizational patterns, Swearer's essay is a study of the ways in which formal agencies for social control and for the communication of social goals to a population may be disrupted by nuclear attack. It is in patterns of administrative organization that the political institutions of a society are brought into direct contact with daily needs of local areas and the general citizenry. These contacts, when translated back through administrative channels, provide the principal formally organized means for communicating local needs and local conditions to the level of government charged with taking a society-wide view of social needs and goals. How will administrative structures respond to nuclear attack?

Second, Swearer's essay uses the comparative method of social analysis to show how different basic value and procedural assumptions deriving from different cultural systems are manifested in contrasting patterns of administrative organization. Demographic and economic studies of the social effects of nuclear attack have the advantage of readily available bodies of data and conceptual techniques for simulating the particular effects of nuclear attack. In a study of the effects of attack on political institutions, the analytic task shifts into domains where less precise techniques are available, especially if the goal is to make predictions of institutional processes over time. The use of the comparative method offers the possibility of making comparisons between institutional systems in the absence of analytic techniques for defining and directly projecting institutional processes within a single institutional system.

The Soviet Union is used for purposes of comparison with the United States, since it is a large complex society which has followed an alternate institutional path toward industrialization. Within the cultural system of Soviet society, a relatively high degree of official and ideological control over individual behavior has been

customary. Soviet administrative organizations function, therefore, in a cultural and institutional environment which contrasts markedly with the assumptions which govern American administrative patterns. By contrasting the bases of American administrative patterns with those of the Soviet system, Swearer has sought greater clarity in defining the dimensions and projecting the responses of the American administrative system as it might be subjected to hypothetical nuclear attack. The ambiguities in projecting American responses reflect the pluralistic foundations of American government and politics. As a vehicle for defining the domains of these ambiguities, the contrasting example of Soviet practices and assumptions provides a basis for systematic comparisons. Even more than being an essay on patterns of social structure and social organization, then, Chapter V is a study of the comparative effects of values and assumptions in contrasting cultural systems, as these systems act as determinants of institutional and organizational structure.

Swearer examines the vulnerability of political institutions as it may be a product of problems in two complementary stages of emergency. In the shorter term, the crucial question is whether the political system can handle the shock of attack, to maintain order and to mobilize the population for the enormous tasks which will follow attack. In the longer term, the crucial question is "the capacity of the political system to facilitate longer-run social and economic development". Complicating the problem of defining the vulnerability of political institutions is the possibility that political institutions and their bases may shift after attack --- but shift in fundamentally adaptive directions. This possibility is especially important to consider when it is remembered that political institutions appear to be especially subject to pressures from other institutional sectors.

With this as background, Swearer sketches the striking differences between American and Soviet experiences with massive disaster. Whereas American institutions have experienced only localized disaster in recent history, the Soviet Union has had three major periods of generalized disaster. During 1914-1921, during the institutional reconstruction of the 1930's, and during World War II, Soviet institutions were defined and subjected to widely pervasive stress. Although there were important variations from these generalizations, Swearer summarizes the Soviet experience in World War II in the following terms:

(1) "By and large the Soviet population remained loyal".

(2) "The Party cadre assumed direct and detailed leadership of the war effort throughout the country".

(3) "Local authorities demonstrated some initiative and flexibility in coping with the tremendous demands. Nonetheless, this flexibility was contained within the existing organizational and institutional structures".

(4) "The end of the war was soon followed by a national campaign to purge the Soviet Union of any deviations resulting from the dislocations of the war. Central direction in economic planning and political organization was ruthlessly enforced. 'Rootless cosmopolitanism' became the focus of attack in a campaign to restore ideological orthodoxy".

Although Soviet administrative structure is extraordinarily rigid by American standards, it has been sufficiently flexible to create patterns in which adaptive responses to disaster could be made. Swearer observes that "In a very real sense, the Soviet political system was born and tempered in disaster. Indeed, it was designed to handle crisis, in part induced by the political system itself". Thus a very important question emerges which is not fully resolved in Swearer's essay: Is the Soviet system "better adapted" for withstanding massive stress than American institutions? If so, what might American planners derive from a more intensive study of Soviet processes? But here the question must be redefined. The Soviet system appears well adapted to withstand the immediate stresses of massive disaster, but is it as well adapted to longer term processes of reconstruction and recuperation? Here it is important to note the problems which Soviet planners have encountered in guiding general institutional processes of industrialization and modernization.

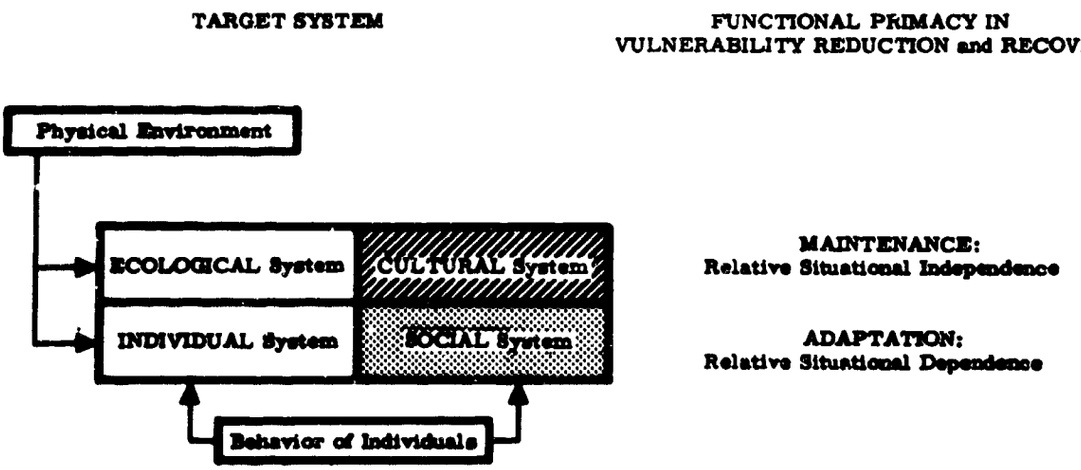
In providing tentative answers to these issues, Swearer applies a contrasting pair of ideal types to the description of societies at various stages of modernization and recovery. The United States is an example of a "market" type of society, whose patterning of complex institutional differentiation creates interacting problems and ambiguities in control, but also relatively greater institutional resources for a variety of social tasks and challenges. The Soviet Union is, on the other hand, an "organizational" society, with less differentiation, greater immediate abilities

for precise social controls, and more rigid constraints upon institutional developments and adaptations. Swearer proposes that massive stress against the American society will stimulate the growth of "organizational" characteristics, although this would not necessarily mean that the United States ceased to be a "market" society. In contrast, the same disaster striking Soviet society is likely to retard or reverse the development of "market" characteristics, which allow greater long term variety and flexibility in adaptive responses. Nuclear attack is likely to be an occasion for "the re-affirmation of the organizational society" in the Soviet Union. For this reason, it may result in a relatively greater long term loss to the Soviet Union, both in capacities for specific recovery and in resources for the complex demands of maintaining an industrial social order.

As an essay in comparative analysis, Chapter V compares two differing cultural systems, which contain the effects of marked differences in historical experiences. From these cultural systems derive patterns of social structure which appear to have characteristically different capacities to respond to the administrative and organizational demands created by nuclear attack.

Figure Va-1

PRIMARY TOPICAL EMPHASES OF CHAPTER V



Chapter V

LOCAL GOVERNMENT IN THE U.S. AND THE U.S.S.R. UNDER STRESS: A COMPARATIVE VIEW OF SOME POLITICAL-ADMINISTRATIVE DIMENSIONS OF NUCLEAR ATTACK

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I. The Vulnerability of Political Institutions

This paper addresses itself to a cluster of related questions concerning local government under stress: which characteristics of political-administrative institutions enhance their ability to cope with the enormous social, economic, and political strains generated by a major, generalized disaster such as nuclear attack; and which impair their ability to function under such conditions? Further, what are the features of a local government that promote long-range economic and social reconstruction? Under what conditions might the stresses set in motion by a nuclear attack result in major modifications in the pre-attack political system, and in what directions?

This working paper should be regarded as an initial exploration of the complex analysis of the vulnerability to nuclear attack and recovery capability of local political authority in the United States and the Soveit Union. It makes no claim to be definitive or to have exhausted all the possibly relevant data for such a study.[1] Rather, I have sought to explore the methodological problems involved in such an investigation, to examine the characteristics of the two political systems which might be critical in recovery from a generalized disaster, and, finally,

[1] In fact, at this stage of investigation, I would be greatly surprised--and disappointed--to find overwhelming agreement with all parts of the analysis contained herein.

to suggest some of the possible dimensions of political recovery from nuclear attack. The materials on which this study are based have been drawn from disaster, recovery and civil defense studies, literature on comparative government and political modernization, and studies of American and Soviet government and politics. In addition, I have utilized knowledge gleaned from my own studies of Soviet local administration and politics.

I am only too painfully aware of the staggering difficulties of such a project. A society has never sustained a general nuclear attack, and hopefully never will; therefore we are analyzing a situation with which we have had no historical experience. Data from local catastrophes and generalized non-nuclear disasters and studies of recovery from World War II are useful, but in the nature of things, can only be suggestive of how political systems might react under the tremendous stress of a nuclear attack. Not only are the methods of extrapolation from the existing situation to that of post-attack society difficult to determine; the problem is compounded by the fact that we are extrapolating from a partially comprehended present. The number of possibly relevant variables--even in a delimited study such as this--are immense, not to mention the difficulty of ordering them according to relative vulnerability and importance for societal recovery.

In the Soviet Union and the United States, we are dealing with dynamic, not static, political systems whose directions and rates of evolution are not entirely understood. Descriptions of these two political systems which were standard ten years ago may now be invalid in several critical respects. This paper attempts to delineate lines of change, but it may well err on the side of caution in estimating their potential impact on political vulnerability to nuclear attack.

Finally, the biases of the writer cannot be wholly eliminated from such a study. The selection of data and the focus of attention will reflect his own values and intellectual predilections. The greater the number of variables to be handled, the broader the level of generalization, and the further extrapolation takes one from verifiable descriptive material, the more significant become these values. While I do not have an axe to grind in this study--which does not always appear to be the case with some studies of this genre--there are at least two types of bias to which such a study is prone. The author has known personally as a citizen

only one of the political systems involved, a society to whose institutions and values he is intellectually and emotionally tied. Moreover, as will be discussed in the body of the paper, the political values of American society are multi-faceted and sometimes contradictory and the author may give greater weight to some aspects of the American tradition than to others.

There is yet another level of bias to which studies of recovery from nuclear war are uniquely susceptible. The general question of what will remain after a nuclear holocaust is highly controversial. Some have asserted that in the event of nuclear war there would be precious little, if anything, left to recover; or that civilization would be set back to at least the level of the Middle Ages.[2] Such views imply that not only are studies such as this useless or fantasy; even worse, they are inherently irresponsible for they soften the catastrophic appearance of nuclear war and make it seem less awesome; they may well, therefore, have the effect of lessening fear of a nuclear conflict among policymakers and the population at large. There can be no doubt but that a thermonuclear war would be an unmitigated disaster, not only in human casualties and property damage but in permanent alterations in the character of the devastated society. Even if a society could recover fairly rapidly, many of its institutions would probably undergo profound transformations--and of a nature that might very well not be welcome from our present perspective.

Nevertheless, the assertion that civilization, as we know it, would be completely wiped out is unprovable (as indeed is the opposite proposition that society would recover rapidly from such destruction); and while we stand in dread of a thermonuclear war, there is good reason to study its possible effects. By anticipating the impact of such a disaster, planning and precautions may be taken to lessen its consequences and speed recovery should ever the unwanted holocaust occur. Moreover, aside from the problems of vulnerability to nuclear attack, such an investigation has a broader purpose. By hypothetically placing institutions

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[2]See footnote 8 for official estimates of fatalities in the event of nuclear attack.

under tremendous stress and testing their reactions, new insights may be gained about present political systems.[3]

Not only does this study assume that society will recover, but that the post-attack society will have some continuity with pre-attack society, i.e., the legacy of the past will have some relevance for the future. If one were to proceed on the assumption that there would be complete discontinuity, that the slate would be wiped clean and the society would build from scratch, there would, of course, be no grounds for making such a study and speculation could only be rank. The latter assumption does not strike the author as tenable; for while undoubtedly there would be considerable innovative behavior after a nuclear disaster, the traditions, ideas, beliefs and institutional remnants would profoundly affect patterns of innovation. Nonetheless, since innovative behavior is difficult to predict and we must proceed largely by extrapolating from current behavior, it is quite possible that this study contains a conservative bias.[4]

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[3]While this study was undertaken as an addition to the literature on national security, it is hoped that its worth will extend beyond questions of vulnerability to, and recovery from, nuclear attack by providing useful comparative perspectives about Soviet and American political systems--especially their resiliency and sources of support. Zbigniew Brzezinski and Samuel P. Huntington have recently written a pioneering comparative study of political power in the U.S. and the U.S.S.R., which has been suggestive in the preparation of this study. This paper, however, differs in focus from the Brzezinski and Huntington work in that it hypothetically places the two governmental systems under the stress of nuclear attack, is concerned primarily with the lower levels of the political systems and pays greater heed to institutional structures. See: Zbigniew Brzezinski and Samuel P. Huntington, Political Power: USA/USSR (New York: Viking Press, 1964).

[4]Even if the attack should bring on a fundamental political and social revolution, the most radical form of innovation, the heritage of the previous system would have to be reckoned with. The Russian Revolution of October, 1917 certainly marks a watershed in Russian history, but it did not and could not mean a complete discontinuity in the development of Russian society. For a comprehensive analysis of continuity and change in Russian society, see: Cyril E. Black (ed.), The Transformation of Russian Society (Cambridge: Harvard University Press, 1960). In the eyes of some readers this paper may seem particularly conservative for it does not foresee as likely the revolutionary alternative after a nuclear attack in either of the two societies. While one cannot positively rule out revolution under the unknown physical, institutional and psychological conditions following nuclear war, to hypothesize such a precipitate from nuclear disaster would be more plausible if a society

II. The Comparative Study of the United States and the Soviet Union: Methodological Issues in Assessing Vulnerability to Attack

The Use of Comparative Analysis

This study proceeds through a comparative analysis of American and Soviet local government.[5] At the outset it must be emphasized, however, that there will be no attempt to evaluate which of the two political systems is most vulnerable to nuclear attack. Their potential strengths and weaknesses at the local level will be assayed; but weights will not be assigned, nor will they be jotted up to provide an overall balance sheet of relative vulnerability. The Soviet Union was selected for comparison with the United States not only, or even primarily, because it is our major antagonist, but because it is an industrially developed, increasingly urbanized thermonuclear power whose political-administrative system varies decidedly from our own, having evolved under quite a different set of circumstances and operational demands. By attempting to anticipate the reactions of these two markedly different sets of institutions to a hypothetical nuclear attack, we may be able to visualize more clearly those factors that contribute to governmental viability at times of crisis. Such an enterprise obviously involves sticky methodological questions. Consequently, this study will address itself to some of these pertinent problems of comparative analysis; however, it will also attempt to go beyond methodological considerations by providing a number of observations about the likely local government reactions to stress in the U.S. and the U.S.S.R.

(footnote 4 continued) were already being shaken by revolutionary portents. The general causes of revolution have been examined by Crane Brinton and others. Broadly speaking, revolution would appear most likely when the established regime, prior to the catastrophe, had proven itself ineffective, ceased to be regarded as legitimate by large and powerful sections of the population, and failed to devise suitable methods of control--both persuasive and coercive--to ensure its continued dominance.

[5] See Neil J. Smelser, Chapter VI, below, for a discussion of the usefulness and problems of the comparative method. Several levels of comparison are involved here: the pre-attack with the anticipated post-attack U.S. local political system; the pre-attack with the anticipated post-attack Soviet local political system; the U.S. pre-attack with the Soviet pre-attack local political system; and the U.S. post-attack with the Soviet post-attack local political system. Both positive and negative comparisons are made.

The variables involved in assessing the vulnerabilities of a whole society to nuclear attack are so numerous, complex and uncontrollable that to reduce the investigation to manageable proportions the researcher normally isolates one particular facet of the total problem for intensive study, e.g., the demographic impact of nuclear attack or the technological problems in economic recovery. These single factor analyses must necessarily utilize the device of ceteris paribus ("other things equal") to simplify the complex real situation. Other factors--psychological, organizational, political, etc.--are assumed to be known and constant. For example, a study of economic recovery after a nuclear attack can start with a base line of estimated damage to the economy and then project growth rates on the basis of past performances of the economy and the state of technological advance, leaving aside considerations of possible governmental policy.[6]

Local Government and Political Behavior

This study isolates the factor of local government--its vulnerabilities and recovery capabilities--for analysis. It is one of the contentions of this paper that a major disaster in a modern industrial society will increase the need for, and sorely test, political leadership. The experience of combatant nations during the last two world wars and the results of local disasters support such an assertion. In short, political leadership is a critical factor central to any projection of societal recovery from nuclear attack.

Not only is political behavior one of the most crucial variables in recovery from a nuclear attack, it may well prove to be the most difficult to isolate and control in recovery studies. Prediction in politics, even under normal circumstances,

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[6]Sidney G. Winter's Economic Viability after Thermonuclear War: The Limits of Feasible Production (Santa Monica, Calif.: The RAND Corporation, 1963) provides such an analysis. See especially Ch. 7. It is also common to assess future economic capabilities for both the United States and the Soviet Union during peacetime in this manner, by stating the current indices of production and projecting them for a number of years according to formulas based on past growth. As one among many, see United States Congress, Joint Economic Committee, Hearings: Dimensions of Soviet Economic Power, 87th Congress, 2nd Session, 1962, in which a number of economists assess the potentials of the Soviet economic system, sometimes in comparison with the United States'.

is often hazardous; it becomes even more difficult under conditions of a nuclear disaster when political leadership (as I argue herein) would find itself operating in a substantially altered environment and under a greatly increased load of demands.

Political scientists--of both the traditional legal-institutional school and the behavioral persuasion--have quite naturally and rightly tended to investigate, and generalize about, political man's patterned (i.e., repetitive and/or predictable) behavior. In their investigations they have sought identifiable, predictable patterns of political behavior. The institutionalists have seen political behavior in terms of institutional actions that result from custom or weighty social and economic determinants. The behavioralists view political behavior primarily as a derivative of more basic economic, social and psychocultural forces.[7]

As a natural consequence of this concern with patterned political behavior, a degree of determinism tends to pervade much of the writing in political science; less weight is given to political creativity and less attention to political systems as "capable" of largely autonomous variation which can result in profound economic, social, and cultural change.[8] The experiences of the Soviet Union and other communist

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[7]Glenn D. Paige, The Rediscovery of Politics (Bloomington: Indiana University Comparative Administration Group, American Society for Public Administration, September, 1963). (Mimeographed.)

[8]Ibid., p. 6.

American political scientists have been particularly inclined toward this orientation which plays down the autonomous rule of political leadership, in large measure because of our legalistic liberal-democratic political tradition in which political actions and policy-making are seen primarily as the result of underlying social forces operating through established and custom-laden procedures and institutions. The political system is often viewed as a kind of institutional Geiger-counter registering the impulses generated by the body politic.

For a penetrating and sprightly discussion of the various theories applied by social scientists in analyzing the Soviet Union that touches on several of the problems raised here, see Daniel Bell, "Ten Theories in Search of Reality: The Prediction of Soviet Behavior in the Social Sciences," World Politics, X, 3 (April, 1958), pp. 327-365. In another context I have also discussed the difficulties faced by both Soviet Marxists and Western social scientists in handling the often seemingly capricious element of leadership in analyses of the Soviet political system: see Howard R. Swearer, "Bolshevism and the Individual Leader," Problems of Communism, XII, 2 (March-April, 1963), pp. 84-93.

regimes, and those of the new nations, where political leadership is explicitly viewed as the lever to transform society, has called attention to the importance of politics as a means by which men, through the setting and organized pursuit of societal goals, attempt to control their environment. Likewise, a study of the role of government in disaster and recovery must necessarily be cognizant of the fact that political behavior is likely to be more innovative than before the crisis. Not only will there be greater demands for independent, ad hoc action placed on the political leadership, but a number of precedents and social, economic and psychocultural determinants of previous political activities will have been affected.

While previously I argued on behalf of the continuing influence of the historical legacy (see pages 461 and 462), here I have emphasized the greater leeway political man may have to determine his future after a nuclear attack in order to provide a caveat against expectations that we can determine with precision political behavior in post-attack society. For, if one anticipates a heightening of innovative, relative to patterned, behavior after the disaster, it becomes more difficult to project current political institutions and strategies into the future.[9]

Assumptions about Attack Impact: The Generalized Case

One of the most dramatic, and recent, threats to existing systems of political institutions is the possibility of a thermonuclear disaster. To understand the threat involved, we must make some assumptions about the type of attack envisioned. It should be noted at the outset, however, that precise assumptions about the level and pattern of nuclear attack are not as critical in the examination of political vulnerability as they are in studies of economic and

[9]Not only does the likelihood of innovative behavior make post-attack analysis more difficult, it may also make it more controversial, for some of the projected innovation may run counter to strongly held current values and hence be politically sensitive. If, for example, an investigation suggested that martial law and military rule might be likely after nuclear attack, this conclusion would affront the deeply held value of civilian supremacy in the U.S. (and in the U.S.S.R. also for that matter). Again, if a study concluded that only the federal government could conduct an adequate civil defense program, or that one result of nuclear attack might be a tendency toward a unitary system of government, a number of near-sanctified political beliefs would be endangered. This study is doubly jeopardized for not only does it raise sticky questions about innovation, but it does so in a comparative context with Soviet institutions.

demographic vulnerability where the quantity of absolute physical damage to the nation's economic plant and population not only constitutes a base line for estimation of the recovery potential but itself is a major component of the investigation. Damage to the political system cannot be quantified in a similar manner for we are concerned not only with the destruction of governmental personnel and records but with the impact of disaster on values, institutions and the political behavior of the remaining officials and the population as a whole. Of course, variations in the severity of the attack will affect the burdens placed on political institutions; but, for our purposes, it is sufficient to postulate a general nuclear attack, either counter-force or counter-value in dimension.

We are not concerned here with the destruction of a single city in the event of a bizarre exchange occasioned by nuclear accident. Although far more devastating locally, such an occurrence would partake of the nature of a local disaster like an earthquake or hurricane, and the literature on local disasters would be applicable. Even though such an event might bring about profound changes in international politics and our foreign policy, it would not likely pose a major threat to the political structure as a whole.

In a more generalized nuclear attack it is accepted that some regions will suffer more extensive damage than others.[10] Nevertheless, when looking

[10] For this reason a generalized national civil defense plan for local governmental action must take cognizance of the possible differential impact of a nuclear attack upon various sections of the country and upon rural and urban areas. For example, under some attack possibilities programs that stress fire-fighting, debris clearance and medical care for mass casualties are needed in urban areas, which are more likely to suffer the direct effects of nuclear damage. In contrast, rural areas might emphasize preparations for refugee care, food distribution and medical assistance to target areas. Local civil defense units need guidance to maximize their efforts and to fit into an overall program which makes allowance for possible geographic differentiation of attack impact. It would appear, furthermore, that implementation of differential local civil defense programs has lagged behind planning.

The present paper deals with the major dimensions of local government in general and does not attempt to analyze in detail the possible differential impact of a nuclear attack on various units of local government. Moreover, it implicitly gives greater attention to urban than rural areas. This broad focus in no way implies that the problem of differential impact is unimportant. For example, a nuclear disaster could pose a particularly severe problem of law enforcement for understaffed rural governmental units.

at a system as a whole even a counter-force attack would create a fallout threat important enough to demand immediate political decision-making extreme enough in scope so that some nation-wide stresses would occur. A large attack, either counter-force or counter-value, could substantially diminish the possibilities of inter-regional assistance and have the effect of reducing--although not eliminating entirely--the differentiation in kinds of problems met by local governmental units.[11] The important point is that a massive load of new issues would require governmental initiatives at several levels. In the United States housing, health, transportation, communications, food distribution and hundreds of other functions would at least

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[11] In his statement to the House Armed Services Committee on February 18, 1965, Secretary of Defense McNamara indicated that the Administration now doubted that a counter-force attack could be separated from a counter-value attack. He provided the following summary of the estimated effect of a nuclear attack on the U. S. in the early 1970's:

ESTIMATED EFFECT ON U. S. FATALITIES
OF ADDITIONS TO THE APPROVED DAMAGE LIMITING PROGRAM

(Based on 1970 population of 210 million)

	(Millions of U. S. Fatalities)	
Additional Investment	Early Urban Attack	Delayed Urban Attack
0 billion	149	122
5 billion	120	90
15 billion	96	59
25 billion	78	41

At the same time, the Secretary of Defense stated that even after absorbing a first strike, the United States missile retaliation would cause more than 100 million Soviet fatalities. (It is estimated that the Soviet population in 1970 will be approximately 240 million.) (New York Times, February 21, 1965, p. 10.)

Thus, even if extensive "damage limiting" measures are taken, the destruction of a nuclear attack in the early 1970's would place stupendous burdens on a society and its political institutions. In the worst case, where 149 million persons or almost three-fourths of the population is killed, the problems of recovery appear to border on the overwhelming.

temporarily be transformed from private to public concerns.[12] In the Soviet Union many of these decisions are already integrated into the governmental process, but again, the increase in volume, complicated by the absence of customary information, channels of command, etc., will tend to create significant new stresses especially on the level of local government. The level of attack, then, is assumed to be sufficiently stress-producing to demand innovative behavior, or at least adjustments of old patterns.

While the survival of governmental personnel, resources and records would be unevenly distributed among regions and governmental levels, this paper is based on the assumption that a significant proportion of them would be preserved. Whether in fact they would survive depends on the conditions of the attack--especially the amount of warning--and prior civil defense preparations. We cannot know with certainty the scope of preparations to protect governmental personnel and documents in either the Soviet Union or the United States. But the assumption of considerable preparation is more than reasonable, since a relatively small investment used to protect officials, both Federal and local, would be crucial--and immediately rewarding--to post-attack society. Moreover, such protection is one of the most easily implemented forms of civil defense, even in a society where many individuals are, if not hostile, at least apathetic to a wide-ranging civil defense effort. While the national governmental apparatus would be one of the prime targets in any general attack, on the other hand, preparations at this level to protect key officials are more elaborate.

Criteria of Vulnerability of Political Institutions

For analytical purposes, the vulnerability of political institutions may be examined in relation to two general stages of response to emergency: (1) the ability of the political system to handle the shock of the attack, to maintain order and to mobilize the population for the tremendous tasks in the period immediately following the attack; and (2) the capacity of the political system to facilitate

[12] The government might decide to use private channels to deal with these problems, but elected and appointed officials would have to make decisions and enter more extensively into the process in some way.

longer-run social and economic development.[13] In reality these two operations are closely interdependent. The manner in which the political system handles the first will influence profoundly the second phase of recovery. Administrative institutions and processes developed to handle the immediate post-attack period will affect succeeding patterns of governmental organization and activities. As in the case of the World War I "temporary" buildings in Washington, temporary expediencies have a way of lingering on. As one authority observed in testimony before a Congressional Committee on the subject of martial law:

> It will not do to, say, have martial rule for the first few days and then switch back to civil administration. Any post-attack administration, civil or military, would at once begin to work out ways to establish channels for getting things done. And, once those patterns were formed, it would be exceedingly difficult to shift to a different system.[14]

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[13] As used here, the "short-term" period following the attack indicates not the relatively brief period of a month or less when people are protected in shelters, but the first few months after emergency perhaps extending on to a year or more. Its exact length would depend on the amount of damage. It includes not only the emergence phase but also part of the adjustment phase as identified by Neil J. Smelser, Chapter II above, "The Social Dimensions of Nuclear Attack." During this period the society will be occupied first with handling the immediate consequences of the attack--care of the injured, debris clearance, housing evacuees--and then with the initial efforts at both physical and institutional reconstruction. Although communications and transportation will gradually be restored, for a substantial time local communities will largely be thrown back on their own resources.

"Longer-term" recovery indicates the years following this early period when the immediate consequences of the attack will have receded and physical and institutional recovery will be in full swing. Although these two periods can be delimited for analytical purposes, in practice they would merge into each other.

Although the shelter phase does not fall within the purview of this paper, it should be noted that shelter experiences such as the development of leadership and the existence of conflict or consensus will influence the configurations of the post-emergence period. With careful planning and preparations, the shelter phase might be converted into a valuable intensive training period for the survival and reconstruction tasks facing the population upon emergence.

[14] Testimony of Professor Charles Fairman, Harvard University, before the U. S. Congress, House of Representatives, Subcommittee of the Committee on Government Operations, Hearings: Civil Defense for National Survival, 84th Congress, 2nd Session, 1956, Part II, pp. 297-298.

The point of this citation is not that military rule would necessarily continue for a long time, but that the nature of the immediate response will have lasting effects, both direct and indirect.

In an attempt to evaluate the total process, this paper is particularly concerned with longer-ranged political recovery. It is not an extensive survey of the civil defense preparations at the grass roots in the U. S. and the U. S. S. R.;[15] nor an attempt to describe in detail how local authorities would likely react to nuclear disaster. Rather, it attempts to utilize data on civil defense and expectations of the initial reactions of local authorities to a tack in order to discuss the major dimensions of the recovery of political institutions.

A discussion of vulnerability should also note that although the effects of a nuclear attack cannot be entirely anticipated, suitable preparations could reduce the capriciousness of the impact. Identifying the potential strengths and weaknesses of current political systems under the hypothetical stress of nuclear attack can provide the basis for planning to shore up political defenses. The degree of preparedness definitively influences the nature of the post-attack political system.

The Problem of Defining "Political Recovery"

A final theoretical perplexity in the study of political recovery is the concept of "political recovery." If by recovery we simply mean a return to the status quo ante, then, of course, there is no definitional problem. However, as mentioned already, it may well prove impossible or even undesirable to restore the pre-attack political system without major alterations in view of other economic and social imperatives and goals. The preponderance of post-attack literature has discussed survival and recovery of personnel and physical resources.[16] But post-attack organization depends as well upon maintaining value-invested patterns of authority: social institutions.

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[15] U. S. studies are numerous and extend from civil defense manuals published by the Office of Civil Defense to Hearings before Committees of the Congress. Selected references to the latter will be made throughout the paper.

A caveat should be added, however, that civil defense studies and planning do not necessarily represent the actual state of civil defense systems. A study of preparations in the U. S. S. R. has been made by Leon Gouré, Civil Defense in the Soviet Union (Berkeley, Calif.: University of California Press, 1962).

[16] For studies in the economic field, Sidney G. Winter, Jr., op. cit.; Benton F. Massell and Charles Wolf, Jr., Economic Development and Postwar Recuperation: A Comparison of Industrial Priorities (Santa Monica, Calif.: The RAND Corporation, January, 1962).

Economists can speak about economic recovery with some degree of clarity since the output of goods and services can be aggregated and measured at least approximately by such tools as gross national product. But what is political growth? How can it be measured? The difficulty of finding a root definition derives in part from the lack of consensus about political values. As a popular concept to many--perhaps most--Americans, political recovery would probably connote the restoration of viable democratic government, including federalism, the system of checks and balances, two parties, limited government. On the other hand, a number of people might well feel the dislocations attendant on nuclear disaster had created opportunities for some fundamental political changes. The majority of the Soviet citizenry would hardly perceive political recovery according to the American image; but they might not necessarily favor a concept of political recovery which implied a wholesale return to the current political-administrative system, let alone the earlier Stalinist model.

Still another aspect of the definitional problem is that political recovery cannot be judged in isolation from other societal processes. Purely political attributes of a system are not the sole criteria for assessing political development. For example, it is conceivable that in the wake of a nuclear attack, attempts in the U.S. to maintain unchanged our carefully balanced democratic political institutions might be counter to the needs of society for authoritative decision-making, especially in the immediate post-disaster period.[17] That is to say, political recovery cannot be measured only in terms of democratic processes; it must also take into account the ability of the political system to facilitate desirable economic and social recovery.[18]

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[17]The origins and evolution of American political institutions have produced a very distinct structure suitable for the current need to represent and mediate among societal interests. Later discussion of institutional growth and development will indicate some of the inherent strengths and weaknesses when these institutions face radical emergencies. See pages 499-503.

[18]Gabriel Almond has recently attempted to show the relationship between a political system and its environment in the context of a developmental approach (i. e., to adapt systems theory in a developmental direction). He introduces the concept of the "capabilities of a political system" and by so doing raises questions about the impact of the political system on its environment and vice versa. In this manner he hopes to be able to characterize the performance of a political system

In addition to the more traditionally accepted post-war German and Japanese experiences, the growing body of literature on political modernization in the new nations might provide some insights into this problem.[19] For example, the following portion of a definition of political modernization, borrowed from a writer who has studied the process, might open a fruitful line of investigation: "A political system is said to be developing when there is an increase in its ability to sustain successfully and continuously new types of social goals and the creation of new types of organization."[20]

Finally, although it is discussed later, it should be noted parenthetically here that the characteristics of a political system which best equip it to handle short-term problems after a nuclear attack may not be the same as those which would best facilitate long-range societal recovery. Thus, while a particular political system might perform more efficiently and effectively in the short-run, it could place a drag on long-term recovery (and vice versa). In any case, the responses of political systems to nuclear attack would vary from one society to another in accordance with the dominant political values, the backgrounds and experience of the major political officials, and the particular nature and operations of political institutions.

(footnote 18 continued) and to compare political systems according to their performance. He suggests five categories of capability: extractive, regulative, distributive, symbolic and responsive. These capabilities are viewed as functional requisites that any political system must meet to some degree. Gabriel A. Almond, "A Developmental Approach to Political Systems," World Politics, XVII, 2 (January, 1965), pp. 183-214.

[19] For a survey of some of the theories of political modernization see Alfred Diamant, Political Development: Approaches to Theory and Strategy (Bloomington, Ind.: Indiana University Comparative Administration Group, American Society for Public Administration, September, 1963). (Mimeographed.) See also Robert A. Packenham, "Approaches to the Study of Political Development," World Politics, XVII, 1 (October, 1964), pp. 108-120.

[20] Diamant, op. cit., p. 21. Some writers on this subject eschew the terms "development" and "modernization" because they have a normative connotation. They prefer a more neutral term such as "political change" which does not imply evolution toward some pre-conceived end and hence avoids problems of etlino-centrism.

Problems in Applying the Comparative Method to the American and Soviet Cases

The United States. Social scientists know much more about American than Soviet society, yet we feel less secure in generalizing about our own political system under stress than about the Soviet system. (In candor, it is often easier to generalize on the basis of less information.) In large measure this hesitation derives from the pluralistic character of American society and the heterogeneous political-administrative structure, especially at the lower levels. Thus, predictions about local political leadership after a nuclear attack based on knowledge of the characteristics of the Los Angeles metropolitan area might have little applicability for New York City or even San Francisco, let alone Topeka, Kansas. While in the Soviet Union the quality of local political leadership and the scope of political-administrative activity varies from one locality to another depending on geographical factors, economic complexion and ethnic and cultural differences, nonetheless, the construction of political-administrative institutions and the training and experience of local leadership is relatively uniform, enabling us to generalize with greater confidence about the reactions of local government under duress.[21]

Still another hindrance to prediction about the impact of nuclear attack on American political institutions is the dearth of historical material from which to extrapolate. The last generalized disaster[22] in this country was the Civil War; during the intervening one hundred years there have been fundamental transformations in the demographic, economic, ideological and political complexion of the country.[23]

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[21] See Howard R. Swearer, Local Government in the Soviet Union. (Unpublished Ph.D. dissertation, Harvard University, 1960).

[22] The term "generalized disaster" is used by Jack Hirshleifer in his monograph, Disaster and Recovery: A Historical Survey (Santa Monica, Calif.: The RAND Corporation, 1963). See his distinction between "generalized" and "localized" disaster, ibid., p. 2.

[23] It might be argued that the great depression of the 1930's and the war effort during World War II constitute generalized disasters. In the sense that they did place greater strain on the society's political infrastructure, speeded up processes of change and posed at least a potential threat to certain values supporting

There have, of course, been a number of localized disasters in the U.S. -- earthquakes, floods, hurricanes--many of which have been studied intensively for their socio-political consequences.[24] These localized disasters are aids for this study, particularly since we are concerned with local government under stress and, from the viewpoint of the stricken community, a local disaster is "total" enough. Nevertheless, it is obvious that there is a qualitative difference between a localized and a generalized disaster.[25] In the former, the larger community is unscathed and can provide rapid and substantial assistance in rescue, recovery and reconstruction operations. Secondly, the destruction is not so widespread as to pose a threat to the values and institutions of the entire society.

The Soviet Union. In contrast, the turbulent history of the Soviet Union provides three case studies of generalized disaster: 1914-1921, a period of world war, civil war, Allied intervention and class strife; the 1930's, characterized by fundamental institutional reconstruction, involving intensive mobilization of the population, heavy doses of coercion and terror, and widespread deprivation; and World War II.[26] While all three events are pertinent for our purposes, the data

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(footnote 23 continued) primary institutions, these two events can generate information useful to this study. However, the absence of massive destruction of both physical resources and the civilian population makes them qualitatively different from a generalized disaster such as a nuclear attack.

[24] The Disaster Research Group of the National Academy of Sciences-National Research Council has been responsible for most of the disaster studies. A sociological review of most of these studies is undertaken in Allen H. Barton, Social Organization Under Stress (Washington, D.C.: National Academy of Sciences-National Research Council, 1963).

[25] Jack Hirshleifer discusses this point, op. cit., pp. 1-4.

[26] Some might object to characterizing collectivization of agriculture and the initiation of the Five Year Plans in industry during the period 1928-35 as a generalized disaster on a dimension approaching either 1914-21 or 1941-45. It did not, for instance, entail as many deaths as the other two crises. Nevertheless, there was widespread deprivation and suffering and enough deaths from starvation, overwork and political terror to constitute a disaster. In some ways it was a more difficult crisis for the political regime to handle than either of the other two cases because it was self-induced. Not only did the regime's frantic pursual of large-scale social engineering harshly and abruptly disrupt traditional social patterns, it involved outright class warfare. And, unlike the other two periods, foreign

to be gleaned from the experiences of World War II are particularly valuable.[27] Its value as a laboratory to test the Soviet system under strain is enhanced by the fact that it has been intensively studied for precisely this purpose.[28]

(footnote 26 continued) troops did not occupy Soviet soil and, thereby, serve as lightning rods to deflect mass grievances from the political regime.

[27] Hirshleifer, op. cit., utilizes the "War Communism" period as a case of generalized disaster. World War II would appear to be more appropriate. In terms of deaths, decline in non-military production and starvation, World War II, if not equalling, at least approached the dimensions of War Communism and was in almost every way a disaster of thermonuclear proportions. A third of the nation's European territory, including nearly two-thirds of its industrial base, was devastated. Total industrial output declined by one-half; sixty per cent of the coal production was lost.

Some 25-30 million Soviet civilians and soldiers lost their lives. (The latter figure is the well-considered estimate of James W. Brackett in testimony before the Joint Economic Committee, op. cit., pp. 509-510. John Kantner in 1960 suggested the somewhat lower figure of 20-25 million. United States Congress, Joint Economic Committee, Comparisons of the United States and Soviet Economies, Part I, 86th Congress, 1st Session, 1960, pp. 35-36. J. A. Newth has calculated that the war cost about 40 million lives, including both casualties and a drop in the birth rate. J. A. Newth, "The Soviet Population: Wartime Losses and the Postwar Recovery," Soviet Studies, XIV, 2 (July, 1962), p. 347.

Moreover, World War II is a more germane historical event. By 1941 Soviet institutions had crystallized, and hence the war would be a better comparative test of the current Soviet system than War Communism. The World War II case, of course, does not fit well into the series of cases examined by Hirshleifer to develop the argument that economic recovery is facilitated by governmental restraint in controlling the economy.

[28] Alexander Werth's Russia At War, 1941-45 (New York: E. P. Dutton & Co., Inc., 1964) is the most comprehensive, general treatment of this subject available in English. Particularly useful, more specialized studies are: John A. Armstrong, Soviet Partisans in World War II (Madison, Wis.: The University of Wisconsin Press, 1964); Alexander Dallin, Odessa, 1941-1944: A Case Study of Soviet Territory Under Foreign Rule (Santa Monica, Calif.: The RAND Corporation, 1957); Leon Gouré and Herbert S. Dinerstein, Moscow in Crisis (Glencoe, Ill.: The Free Press, 1955); Leon Goure, Political Vulnerability of Moscow (Santa Monica, Calif.: The RAND Corporation, 1952); Leon Gouré, The Siege of Leningrad (Stanford, Calif.: Stanford University Press, 1962).

Given the focus of this paper, the studies of cities under siege are of particular note. The siege of Leningrad, for example, comes as close as any event in recent history to an approximation of the impact a widespread nuclear

World War II constituted a massive challenge for the Soviet regime and a trying test of the political, economic and social system which had been radically--and often cruelly--engineered in the previous twenty-five years. The challenge was not the same everywhere in the Soviet Union; nor were the reactions of citizen and official alike to this rigorous test always uniform. Rumanian-occupied Odessa, for example, reacted somewhat differently from those cities under German occupation. Most Soviet citizens loyally defended their homeland; but some did defect--for various reasons. These variations should serve as a warning that the following "lessons" from Soviet experiences during World War II are generalized:

(1) By and large the Soviet population remained loyal. In part this loyalty was stimulated by the presence of German troops on Russian soil and by the occupational practices of the Germans. The Soviet regime deliberately played on national and religious sentiments among the citizenry to bolster loyalty. Relations with the church were improved and old Russian heroes were revived. The war was referred to as the Second Fatherland War (the first having been that of 1812). At the same time, Marxism-Leninism was soft-pedalled. The theme of Russian patriotism at times eclipsed the communist and internationalist aspects of the state. There were rumors--apparently officially instigated--that the hated collective farms would be abolished after the war; peasants were permitted greater leeway for private initiative. Finally, popular discipline was reinforced by the knowledge that the regime would take drastic and swift coercive action against deviant behavior.

(2) The Party cadre assumed direct and detailed leadership of the war effort throughout the country. At the local level, it was the Party secretary and his staff who made the major (and minor) decisions concerning economic production, food distribution, civil defense, etc. The Party mobilized the population for

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(footnote 28 continued) attack might have on a major metropolitan area. The Russians were not prepared for swift envelopment of the city by the Germans. They were under siege for some two and one-half years, much of that time largely cut off physically from the rest of Russia so that local officials were thrown back on their own resources to handle staggering problems of maintaining industrial production for the war effort, providing civil and military defenses for the city, and obtaining and distributing food to a population on the borderline of mass starvation. Nearly 1,000,000 persons, one-third of the pre-war population, died in the Leningrad siege.

the war effort through its well-established "mass-organizational" techniques; Party "activists" and Komsomols spearheaded these mobilization efforts. It should be emphasized that Party direction of the war effort did not require any fundamental changes in the mechanics of governing in the Soviet Union, merely an intensification of previously established techniques. The ability of the local Party leadership to mobilize the population directly for all manner of tasks and to coordinate the entire war effort of an area was a source of strength for the system. On the other hand, the burdens placed on the Party cadre were enormous, sometimes overwhelming. Not infrequently, the citizenry was mobilized for jobs which were not the most useful for the war effort.

(3) Local autnorities demonstrated some initiative and flexibility in coping with the tremendous demands. Nonetheless, this flexibility was contained within the existing organizational and institutional structures. Moreover, despite the disruptions of the war, central authorities still attempted to control in detail the activities of lower echelons. A substantial degree of central direction of the war effort was inevitable and desirable; however, the political system was so centralized and rigid that it became a source of vulnerability. Local authorities were often reluctant (and afraid) to accept responsibilities not formally delegated from above.

(4) The end of the war was soon followed by a national campaign to purge the Soviet Union of any deviations resulting from the dislocations of the war. Central direction in economic planning and political organization was ruthlessly enforced. "Rootless cosmopolitanism" became the focus of attack in a campaign to restore ideological orthodoxy. Private initiatives in farming were snuffed out by a rigid tightening of the collective farms.

Such a summary of historical evidence is, of necessity, only suggestive and makes no claim to be exhaustive.

Yet despite the relative abundance of useful historical data for calculating the impact of nuclear attack on Soviet political institutions, one must exercise caution and discrimination in the use of these historical analogies. The magnitude and relatively swift onset of World War II from the Soviet perspective still would not approach the catastrophic dimensions nor the abruptness of a nuclear attack.

Only one of several consequences of the latter would be the likelihood of a greater loss of leadership cadres, especially at the local level. Secondly, the reaction of the Soviet people to the war effort and hardships during World War II was substantially influenced by the obvious and painful presence of German troops on Soviet soil. The initial ambivalence entertained by many Soviet citizens toward the prospect of defeat of the Communist government at the hands of the "cultured" Germans was resolved by the physical presence and occupation practices of the German troops so that popular support was solidified around the Communist regime.[29] It is not altogether certain that the government, in the case of a nuclear attack in which foreign troops were not--at least immediately--on Soviet soil, would be as successful in rallying the citizenry around its patriotic banner and directing mass resentment against the foreign aggressor as it was in the last war. The government itself might be subjected to a great deal of scapegoating for blundering into a nuclear war, especially if the enemy were remote and dimly perceived.

There is still another order of difficulties in extrapolating from World War II experiences because all the major variables in a situation can never be replicated. Although the last war was the most recent generalized disaster in the Soviet Union, nonetheless, it occurred twenty years ago; and the period since has been marked by substantial modifications in Soviet society. It is beyond the scope of this paper to treat these changes in detail or to become involved in the fruitless controversy over whether these alterations in the Soviet system are basic and lasting or secondary and ephemeral.[30] Some illustrations at this juncture, however, will indicate the nature of the problem.

Compared to the situation in 1941, there is probably less basic antagonism between the regime and the majority of the population today. Over thirty years have elapsed since the radical transformations of the early 1930's which

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[29] See especially Alexander Dallin, op. cit., pp. 247 ff.; Armstrong, op. cit., pp. 320-322.

[30] For a presentation of a variety of views on this matter see Howard R. Swearer and Richard P. Longaker, Contemporary Communism: Theory and Practice (Belmont, Calif.: Wadsworth, 1963), Ch. 6.

alienated large segments of the population; and not only have dislocated and disaffected persons been reintegrated into society, but new generations have grown up knowing only the Soviet system engineered in the decade of the 1930's. The defeat of Germany and Soviet post-war scientific and economic achievements may not necessarily be popularly credited directly to the political leadership but they have been the source of national pride and as such have helped legitimize the system, and indirectly the leadership institutions. Although slowing somewhat, social mobility remains high and hence opportunities for personal advancement are reasonably good. Compared with the U. S., the web of controls over the citizenry remains intolerably tight; but since Stalin's death, the regime has relied less on open force and terror and more on persuasion and various subtle means of exercising pressure on the individual as procedures for governing society and enforcing acceptable modes of behavior. Living standards have been slowly but steadily improving, and the regime has pointedly conveyed to the population its concern with improving their material welfare. Finally, the number of persons with a stake in the system has grown substantially.[31]

This is not to say that popular dissatisfactions and disaffection do not exist and that, given a choice, the citizenry would opt for the existing system in its entirety. The population, and especially the creative intelligentsia, is less cowed today than under Stalin, and has pressed repeatedly on the limits of officially-approved expression and action. The regime could not be completely insensitive to these pressures. Even though the boundaries of orthodoxy remain narrow by Western standards and opinions judged heretical by the leadership run the risk of being castigated as treasonously anti-communist, greater diversity of expression is permitted. Moreover, improving standards of living and the repeated promises of even more rapid progress in this sector (like those embodied in the 1961

[31] The major exception to this generalization may be national antagonism toward the Russians by the various ethnic groups in the Soviet Union. See Richard Pipes, et al., "Soviet Colonialism: Does It Exist?", Problems of Communism, XIII, 1 (January-February, 1964), pp. 1-24.

Party Program) have whetted popular appetite for the better life. Thus, the regime finds itself under increasing pressure for more rapidly improving living standards and has, perhaps, less leeway in allocating economic resources.[32]

Even though Soviet society remains highly politicized and centrally directed, with the Party acting as the nexus of all societal activities, during the last decade there has been a noticeable, if still incipient, tendency toward institutional pluralism. Various segments of the bureaucracy, differentiated according to function, have developed vested interests and have manifested signs of striving for increased institutional autonomy.[33] In sum, while, on the one hand, the political system today has to cope with less dangerous and fundamental popular alienation than in 1940 and political leadership continues to be the primary instrument for forcing social and economic change; on the other hand, the regime is less able (or willing) to exercise its will coercively over an unquestioning population and, moreover, must assume a greater burden as political broker of various interests.

Not only has there been some growth of institutional pluralism, but, to use Weberian terminology, the Soviet bureaucracy has been developing greater institutional differentiation and role specialization, particularly in industrial administration, which has added immeasurably to the tasks of coordination. The Soviet administrative-economic mechanism is more complex and delicately balanced and hence might be more vulnerable to massive attack than the relatively less differentiated, specialized and simpler bureaucracy of 1940.[34]

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[32]The disappointing harvests after 1958 seriously impeded improvement in living standards and caused a definite morale problem. When the prices of meat and dairy products were raised in June of 1962, this was the occasion for demonstrations and work stoppages in some areas. See Albert Boiter, "When the Kettle Boils Over," Problems of Communism, XIII, 1 (January-February, 1964), pp. 33-43.

[33]The recent introduction of profit as incentive for textile, footwear, and other, as yet isolated, sectors of industry should be recognized as a device to promote greater efficiency. Although these changes may result in more institutional autonomy, they are not primarily responses to such demands.

[34]For elaboration of this point, see below, pp. 513-520.

During World War II, local officials were, as a general rule, overly dependent on orders from above. The lack of authority by local officials resulting from the extreme centralization of the administration was reinforced by the reluctance to accept responsibility, fostered by Stalin's reign of terror. Even during the siege of Leningrad, Moscow ministries attempted to plan industrial production in the surrounded city.[35] Moreover, the inadequate preparation of Leningrad for the siege can also be charged in part to over-centralized administration.[36]

The Soviet political and economic system remains highly centralized by American standards and, as will be discussed later, this feature could be debilitating in recovery from nuclear disaster. However, in comparison with World War II, the administration is probably more flexible and local officials less slavishly dependent on Moscow. Since the mid-1950's, there has been some delegation of authority to lower administrative levels and local officials have been exhorted to exercise their authority more aggressively. Moreover, a new generation of post-Stalinist leaders has been emerging. Although yet to assert their dominance in the highest policy-making bodies, they are knocking at the doors, and have made their presence felt at the lower levels. While there is little consensus among Western observers about the precise character of these new communists in grey flannel suits or their potential impact on society, it would appear that compared to their elders, they are better educated, less ideological, more sophisticated, and more self-assured. Whether, on balance, they would be more resilient and better equipped to cope with generalized disaster than were their World War II predecessors is difficult to estimate. They may well have less of the frontier improvisation spirit of their fathers. On the other hand, they are less terrorized and have had experience operating under fewer central controls and with more authority.

III. A Comparative Overview of the American and Soviet Political Systems

Turning now from methodological considerations, in this section we shall sketch in the salient dimensions of the American and Soviet political systems as

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[35] Leon Gouré, The Siege of Leningrad, op. cit., p. 234.

[36] Alexander Werth, op. cit. p. 310.

wholes. Particular attention will be given to their lower levels and to implications of their structure and functioning for the immediate post-attack period. Finally, Soviet and American civil defense programs will be described in the context of their respective political systems. A political system, through which a society is governed, is composed of a complex interweaving of beliefs, institutions and elites. Thus, we shall discuss in a comparative manner each of these three component parts.

The previous discussion of cases of generalized disaster in Soviet history may provide an appropriate perspective from which to view Soviet government for our purposes. In a very real sense, the Soviet political system was born and tempered in disaster. Indeed, it was designed to handle crisis, in part induced by the political system itself. In contrast to America, Soviet government did not evolve gradually, primarily as a response to the more or less spontaneously expressed needs and pressures of the society; instead it was consciously forged by the leadership to impose its will on society and insofar as possible fundamentally to reconstruct society (and man's beliefs and aspirations). Of course, the Soviet leadership could not be unaware of the broader milieu in which it operated; certainly its efforts at social engineering often produced unexpected results; but, compared to American practice, the Soviet view of the "vocation" of leadership has been less that of political brokerage and more that of a locomotive of historical evolution. In short, the political system has been used as an organizational lever to transform society and to repress, by force if necessary, any popular protest.[37]

In contrast, the political system in the United States has been a reflection of the society. It has been shaped by, and its development has been a response to, existing and emerging social patterns. Although not committed to the status quo, the political system has probably had a conservative impact and has tended to channel change into gradual, peaceful and legal roads.

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[37]The crisis atmosphere that has typically surrounded Soviet administration is reflected in the vocabulary of conflict and war that has peppered leaders' speeches and official statements. The masses must be "mobilized" for the "struggle" to overcome "obstacles" in order to complete successfully the current production "campaign."

There is some deliberate exaggeration in the above descriptions. With the passage of time, Soviet institutions have crystallized and society has become more stable. Various interests have developed some cohesion and represent views that cannot be entirely disregarded by the political regime. Not only has the political system lost some of its freedom to mold society, its compulsion to do so has cooled. In short, the crisis-sustaining nature of the political regime has declined. On the other hand, the power and involvement of the political system in society has grown in the United States. Nonetheless, the general descriptions of the two contrasting political systems remain generally valid.

Viewing the Soviet political-administrative structure as a system designed to handle crisis not only facilitates speculation on its fate in a nuclear attack, but helps to explain its major features: the prohibition on political opposition, the centralization and concentration of political power, the pervasive political direction of society which runs the gamut of responsibilities from spring sowing to primary education, the discipline and the hierarchical construction of administrative chains of command, the "command" economy, the wholistic and official quality of Soviet political ideology, the overlapping administrative and political control systems for regulating the behavior of each individual, and the ability and willingness to use force to compel obedience to central directives.

Values and the Political System

The Soviet Case. The political beliefs, or ideology, that legitimize a political system, assist social integration, help to shape policies and filter reality to both elites and masses, vary markedly between the U.S. and the U.S.S.R. Here we are not so much concerned with the specific content of these two ideologies as with their general nature and how they complement and support social institutions and political procedures. Soviet ideology is an explicit, systematic and dogmatic set of political ideas that attempts to relate all social and political activity to a scheme of historical development.[38] That is, Marxism-Leninism asserts that there are patterns or "laws" of social evolution which can be discerned by proper analytical tools.

[38] Brzezinski and Huntington, op. cit., see Ch. 1.

These laws provide a standard by which to judge both private and public activities, and, naturally, governmental policies can only be correct and progressive if they are purportedly based on a Marxist-Leninist foundation.

By presenting an extreme critique of pre-Soviet society and bourgeois society in general, as well as by claiming to provide a prescription for the future good communist society, Marxism-Leninism has justified radical policies by the leadership even if implementation requires the use of force. Since the Party leadership by definition, is best qualified to interpret the single, correct Marxist-Leninist course, there is no justification for a loyal opposition with an alternative plan of action. Massive politicization of society, as well as the creation of unitary and hierarchical administrative chains of command, are corollaries of the proposition that extensive direction of society by the political leadership is required to achieve the ideologically prescribed good society. The population must be activated by the political leadership. The population must be organized in various mass organizations--like trade unions, local soviets, sports societies, parent-teachers associations--but these organizations, while built around specific interests and activities, cannot be permitted to exist autonomously or represent only a narrow functional interest; rather, they must be overtly coordinated by the political system--and especially the Party--so that they all contribute toward national goals as defined by the leadership. Organizational structures, since they are prescribed by the political elite, rather than sprung up in a more spontaneous manner in response to felt needs, tend to be imposed uniformly throughout the country. As creations of the centralized authority they are subject to frequent change.

Finally, the ideological emphasis on mobilizing society to pursue historically-ordained social goals de-emphasizes "individualism" as such and stresses the importance of the individual in his social context. Any society must balance the aspirations and freedoms of the individual with the requirements of social living. In the U.S., the scale has favored individualism; in the U.S.S.R., the weight has been placed on the side of society and the individual's place and function within the "collective." The collectivized nature of social life in the Soviet Union is

not the result only of leadership governing strategies, for guided collective effort was a characteristic of Russian society long before 1917 and has been reinforced by living and working conditions.

The American Case. While Soviet political values are formally canonized in official documents and exegesis by the political leadership, U. S. political beliefs defy any clear-cut and systematic definition. Changes in American political values have been gradual, largely spontaneous and unguided; efforts in recent years to sum up systematically and concisely American political doctrine (i.e., national purpose) have been at best vague and amorphous.[39] Over the years new concepts have been added, usually imperceptibly and unconsciously, to the corpus of American political beliefs. These values, which include constitutionalism and the rule of law, individual liberty, equality, minority rights, limited government, majority rule, and yet others, are often in tension with one another and can coexist in American political institutions because they have been gradually layered on each other over long periods of time and because they have not become dogmatized. Moreover, value conflicts are soft-pedalled because public policies are only loosely related to political beliefs, since policy-making is largely pragmatic and policies are justified as the most reasonable and carefully considered responses to immediate needs and pressures. In contrast to the chiliastic nature of Soviet ideology with its assumption of scientific laws of historical development, the American political tradition has not been rooted in a particular scheme of historical development to which public (and private) actions must be related if they are to be thought progressive.

This loosely woven set of political values, of course, is consonant with the character of the society and political system in the U.S. The relatively open American society with its multiplicity of groups and interests and its concern for the rights of the individual has led to a political system characterized by responsiveness to major social and economic interests. The political system is regarded primarily as a process whereby interests and aspirations are compromised and

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[39] United States Presidential Commission on National Goals, Goals for Americans (Englewood Cliffs, N.J.: Prentice-Hall, 1960).

represented rather than as an instrument to impose the will of a handful of leaders on the population. Not by chance has interest group theory blossomed in the U.S., where politics is viewed as the "art of the possible." Since public policies are the result of political bargaining, since "progress" in public policy is deemed the result of pragmatic grappling with current problems, political opposition and political conflict are considered normal and essential parts of the political system.

Government, in the American political tradition, has not been regarded as an organizational force to implement far-reaching transformations in society. Indeed, society, as it were, has been viewed as pre-dating government, the latter being created to perform certain regulative functions for which private endeavors were not sufficient. Hence, the sphere of governmental activity was to be strictly limited. Limited government, it should be noted, was valued not only because of the fear of governmental tyranny over individual freedom, but because of the positive value attached to the tradition of community self regulation and self help.[40] The powers of government were limited by splitting it into several parts along both vertical and horizontal lines and carefully balancing these component parts whose powers derived from different sources. The result was a tripartite national government: a federal system in which gaps existed between the powers and responsibilities of the federal and state governments, and local governments maintained some autonomy of action. Diversity of government at the state and local levels was prized because local officials were seen as public servants whose modus operandi should conform to the local environment; and, unlike the Soviet case, diversity was not smothered by the uniformity produced when attempting revolutionary changes through the political system.

With the democratization of the political process, the increasing complexity and impersonality of the industrial economy, growing American involvement in world affairs, as well as the concentration of bureaucratized private power (big business and big labor), the size, responsibilities and power of government--and

[40] It should be noted that the premise of limited government contributed to the ability of the political system to absorb and hold in tension conflicting political values. Since the society is not highly politicized, internal inconsistencies in American political doctrine are not as visible, and pressures to resolve value-conflicts are not as extreme.

especially the executive branch of the federal government--have rapidly expanded in the last half century. Nevertheless, the cleavages in American government, the view of politics as a process through which the pluralistic interests of society are compromised and represented, and the circumscribed involvement of government in society are in marked contrast to the Soviet Union.

Soviet Vulnerabilities and American Vulnerabilities. How vulnerable are these two political ideologies to the stress of a generalized nuclear disaster? How might they influence the course of recovery? The efficacy of a political doctrine for recovery from such a disaster will in large part be measured by how well it serves as a stabilizing and integrative force while, at the same time, facilitating necessary institutional and procedural innovation.

At first glance the systematic and dogmatized Soviet political ideology would appear to retard desirable social change and to hinder leadership flexibility. Indeed, during the late Stalin period, this argument was frequently made. With the benefit of hindsight, however, the proper conclusion to be drawn from this period is that innovation is mainly a prerogative of leadership. If the leadership fails to initiate new policies in response to growing problems, stagnation may result. On the other hand, because the political elite holds exclusive rights of "creative" ideological interpretation, it can manipulate the ideology with some flexibility to legitimize new policy directions. In the 1930's, and again after Stalin's death, the leadership demonstrated considerable resourcefulness in adapting the ideology to changing policies.[41] Thus, ability to manipulate the ideology gives the leadership greater freedom of action than is true in the United States where deeply embedded political beliefs can and do impede initiatives by the national government (this, of course, is not the only factor involved).

The character and role of Soviet ideology, at the same time, tends to generate a dogmatic propensity among middle and lower political echelons and

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[41] See Brzezinski and Huntington, op. cit., p. 54.

inhibits initiatives by local officials.[42] Hence, under this conservative influence, one might anticipate that after a nuclear attack the local elite in the Soviet Union would want to return as far as possible to the familiar political institutions and processes. They might respond with considerable flexibility within the framework of the familiar patterns but would tend to be cautious in attempting far-reaching innovations without central guidance.[43]

Likewise, the leadership would encounter problems if they tried to embark on radical ideological revision at the time of a general crisis when they would be attempting to restore order and re-impose its controls. Despite leadership's ability to manipulate ideology, revisions do run the risk of getting out of hand. De-Stalinization in 1956-57, for example, opened a Pandora's box of unwanted criticism of some basic policies and institutions--even muted questioning of the desirability

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[42]Khrushchev was constantly carping at local officials to show initiative and try experiments. While there have been signs of increased self-confidence by lower cadres and even greater willingness to question some aspects of national policy, by experience, outlook and conditioning lower party officials can hardly be considered ideological innovators. Moreover, despite Khrushchev's preachments, the fact that he was constantly imposing sweeping programs and reforms from above largely precluded initiatives from below. On this point see Howard R. Swearer, "Agricultural Administration Under Khrushchev," in Roy D. Laird (ed.), Soviet Agricultural and Peasant Affairs (Lawrence, Kans.: University of Kansas Press, 1963).

[43]In his study of Soviet partisans during World War II, John Armstrong has pointed out that the partisans re-established local soviets, party committees and other features of the Soviet edifice in the territory under their control behind German lines. He characterized partisan administration as follows:

> At the same time, partisan administration and policy showed considerable awareness of the necessity of 'flexibility' and adjustment, albeit momentary, to the particular demands of the population. Distribution of food, variations in agrarian and religious policy, as well as the general manipulation of propaganda themes, all tend to support this conclusion. Thus the Soviet formula, as reflected here, amounted to rigidity in institutions and long-range aspirations but considerable fluidity in short-term tactics.

John A. Armstrong (ed.), Soviet Partisans in World War II (Madison, Wis.: University of Wisconsin Press, 1964), pp. 319-320.

of the one-party regime. Because Soviet ideology is dogmatized and policies and events must be explained in ideological terms, in the aftermath of a nuclear disaster, it would probably be less resilient, less able to adjust flexibly and piecemeal. Whether it would be totally discredited is impossible to gauge. To forestall such a likelihood, the regime in the short-run is likely to soft-pedal Marxism-Leninism as such in favor of Russian nationalism and propaganda about the achievements of the Russian people under Soviet rule. After having established firm control, the regime might be expected to return for a period to more militant ideological orthodoxy in order to exorcise heretical ideas.[44]

It seems doubtful that American political values would exercise as conservative an influence on recovery processes in the United States. Moreover, nuclear disaster is not likely to challenge the whole corpus of American political beliefs. Both of these assertions are based on the previously elaborated character of American political doctrine, a loosely woven set of diverse values which have not been dogmatized. Indeed, such traditions as local self-government, community self-help and individualism would promote initiative and experimentation at the local level.

On the other hand, the stress of nuclear disaster would place a severe burden on the delicately balanced values composing the fabric of American political doctrine which have evolved slowly and spontaneously through the years and rest on the bedrock of the prevailing spirit of political moderation. Some of these balances would likely be upset. One might expect, for example, that inhibitions on governmental action would be eased, or that equality and the needs of the community might encroach on individual liberty and private property. Both phenomena would be more extreme in the short-run, but would also seriously affect long-term adjustment. The critical question is whether the immediate demands of the situation (especially under conditions of economic deprivation) or the growth of an

[44] This, of course, is what happened during and after World War II. Likewise, after the "revisionist" ferment in 1956-57, the ideological line hardened again--although restrictions were never as severe as during the Stalinist period and lasted only a limited time--and greater stress was given in official propaganda to the achievements of Soviet science and technology, especially in space.

extremist fundamentalist political current would result in resolution of the value tensions and thereby undermine the basis of our democratic political system.

Governmental Institutions and Personnel

The Soviet Case. Local government, as such, does not exist in the Soviet Union; rather the central government has its various agents stationed in the localities.[45] Despite the federal pretensions of the Soviet Constitution, the political-administrative system is unitary and the responsibilities and authority of local officials at each level are bestowed by their superiors in the hierarchical chain-of-command.[46]

In a society where the political elite is committed to large-scale social engineering, the leadership necessarily constructed a political nervous system which would be highly responsive to central commands. Not only are local officials directly subordinate to their superiors and without independent bases of political support in their localities, but also below the apex of the governmental hierarchy, power is fragmented and responsibilities deliberately overlapped. By differentiating the total bureaucracy into a number of separate chains of command and, to some degree, setting them against each other, the leadership attempts to ensure that its channels of communications and command to the local level are not short-circuited by informal concentrations of power in the hands of a small local clique of a single individual. In a city, for example, (the same comments would hold true for a raion, oblast or republic) the important officials will be the Party secretaries from the Party apparatus, the chairman and his deputies of the city

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[45] See Howard R. Swearer, "Decentralization in Recent Soviet Administrative Practice," Slavic Review, LXII, 3 (September, 1962), pp. 456-470.

[46] One authoritative Soviet monograph describes central-local government relationships as follows:

> "Higher organs establish the legal basis and framework of action of lower organs...
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> "A local soviet, in making a decision on the basis of and in execution of laws and ukazy, has the right to detail and concretize norms of given acts only to a degree that does not alter the substantive content of these norms."

(Yu. A. Tikhomirov and I. M. Stephanov, Rukovodstvo vyisshik organov vlasti soyuznyikh respublik mestnyimi sovetami deputatov trudyashchikhsya, Moscow, 1960, pp. 35 and 38.)

soviet executive committee from the governmental hierarchy, the head of the city trade union council, the local representative of the KGB, directors of the most important industrial enterprises, and the local military commander. These men are all located in separate chains-of-command and are responsible to their superiors at the next higher territorial-administrative echelon. There are yet other, lesser officials exercising responsibilities vitally affecting the city, such as the head of the city department of finance, who is primarily an agent of the powerful and centralized Ministry of Finance.

Although almost all economic enterprises in the Soviet Union are state owned, or at least state directed, this fact does not mean that the local officials have authority over all economic activities within their geographical bailiwicks. City officials, for example, do not have jurisdiction over the most important industrial enterprises located in their areas; and, not infrequently, these enterprises own and operate a sizeable proportion of municipal services and housing. Thus, not only is local power fragmented, but the jurisdictions of local authorities are strictly limited.

Of course, some horizontal coordination of activities within a territorial-administrative division is manifestly required . Such territorial coordination is achieved by placing local officials under dual subordination--to their superiors and to local coordinating bodies: the local soviet executive committee and, more important, the territorial party committee. These two bodies, whose memberships overlap in part, are composed primarily of the local power elite and represent interlocking directorates. The Party committee is the most powerful and the local party secretary is the most important territorial official, having general supervisory responsibilities for all activities in his area.

Precisely what responsibilities are vested in local authorities and at what level geographical interests are balanced against central commands varies from one period to another, depending in large measure on the predilections of the political elite. The trends of the last ten years have been contradictory. On the one hand, there has been much talk of de-centralizing the administration by granting more authority to lower officials. Many municipalities appear to have been given a firmer grip over their municipal services, housing and other local activities.

By increasing the powers of the Party apparatus at the lower level, the local Party secretaries have been able to voice more forcefully the territorial point of view.

On the other hand, the centralizing impulse in the Soviet Union is strong. The habit of command, the rigidities in any huge bureaucracy, and the lasting heritage of direction from above all tend to impede radical de-centralization. In addition, the overlapping jurisdictions and control mechanisms, deliberately built into Soviet political-administrative institutions to facilitate central control, frustrate efforts to permit more autonomy to local officials. Finally, too much de-centralization might foster the growth of "localism," a tendency toward regional autonomy.

In mid-1957 industrial administration in the Soviet Union was drastically re-organized. The highly centralized, industrial-branch ministries were abolished in favor of over 100 regional economic councils (sovnarkhozy). Each regional council was charged with administering all types of industry within its geographical jurisdiction. As a general rule, the boundaries of each sovnarkhoz coincided with those of either a small republic or an oblast (province).

At the time, there was speculation in the West that this regionalization of industrial management may have been motivated in part by civil defense considerations, i.e., managerial talent would be dispersed, decision-making would be de-centralized and a powerful link of the political command--the republic and oblast secretaries--would coincide with the major unit of industrial management. In retrospect, however, it appears that civil defense played little, if any, role in the re-organization, which can be better explained on political and economic grounds.[47] At any rate, by 1964 much of this re-organization had been reversed. The sovnarkhozy have been consolidated into forty and stripped of a number of their operational powers which have been returned to industrial-branch state committees in Moscow. In many respects, these state committees resemble the old ministries abolished in

[47]See Howard R. Swearer, "Khrushchev's Revolution in Industrial Management," World Politics, XII, 1 (October, 1959), pp. 45-61. Cf., Alec Nove, "The Soviet Industrial Reorganization," Problems of Communism, VI, 6 (November-December, 1957), pp. 19-75.

1957. The re-centralization of industrial management can be explained on several grounds, but a major factor was the appearance of "localism." The term "localism" covered a number of sins, such as tendencies toward regional autarchy, the pursuit of regional interests at the expense of national plans and even growing corruption stemming from the increased power of local officials vis-a-vis central controls and the ability of local authorities to short-circuit communications channels by forming "family groups"; but at the root of the problem was the inability of the command political economy to tolerate the development of semi-autonomous power centers. In actual fact, de-centralization of industrial management never proceeded to the extent originally suggested by Khrushchev, and the sovnarkhozy were always tightly circumscribed by the State Planning Commission and the Ministry of Finance.

The preceding discussion of Soviet local government has highlighted its dependence on higher authority and the rigidities of the bureaucracy. There can be little doubt that a major disaster which disrupts the command and communications links between the center and the localities would create profound difficulties. Undoubtedly confusion of authority would ensue, especially over control of industrial enterprises whose normal administrative links with the center would have been cut. Nonetheless, the system contains counteracting features which would reduce the confusion.

The mechanisms of horizontal control would be activated. During World War II local authorities were welded into tightly knit operational bodies, emulating the concentration of authority at the top in the State Defense Committee. The local party committees, and their bureaus, which, as noted above, form an interlocking directorate of the local power elite, are ready-made governing bodies. Even at present, they perform myriad functions, and it would be primarily a matter of increasing their authority and controls. Moreover, the party first secretary at every territorial echelon, with few exceptions, would be recognized as the most powerful leader who should take charge of rescue and recovery operations. If the first secretary were killed or disabled, the lines of succession are fairly well known; his mantle would normally fall to either the second secretary or to the chairman of the soviet executive committee. The basis of this assertion of the likely

pre-eminence of the party apparatus in the event of disaster rests on the primary role played by the party at the local level during World War II[48] and the fact that its powers have been increased even further since that time.

By training and experience, the party secretaries are well suited to take on the burdens of leadership under crisis.[49] They have been given formal training at various stages of their careers, both in agitational, propaganda and "mass-organizational" work, and in technical and administrative skills such as economics, accounting, statistics, planning, etc. This formal training in the hierarchy of party schools is interspersed with practical experience at increasingly more responsible and demanding positions.[50]

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[48] Alexander Werth, op. cit., p. 357; Leon Gouré, Siege of Leningrad, p. 302. In Leningrad during the siege, the party organization directly shifted workers from plant to plant and allocated spare parts. See Partiinoe stroitel'stvo, No. 9-10 (1946), p. 19.

[49] For the purposes of this paper, we combine chairmen of local soviet executive committees and party secretaries under the rubric "party secretary", for there is a common leadership pool from which these men are drawn; there is also considerable interchange of personnel between these two positions. Not infrequently the chairmanship of a local executive committee is viewed as a testing and training ground for a party first secretary.

When discussing the Soviet Communist Party, it is important to distinguish between the rank and file and the cadre. The latter are the party apparatchiki or party members fully occupied in party work and paid directly from party funds. The total number of party apparatchiki has never been published. On the basis of fragmentary evidence in 1960 the author estimated the size of the apparatus to be approximately 250,000. See Howard R. Swearer, Local Government in the Soviet Union: Public Participation in a Totalitarian Society, op. cit. Leonard Schapiro in the same year estimated 240,000. Leonard Shapiro, The Communist Party of the Soviet Union (New York: Random House, 1960), p. 572. Merle Fainsod in 1963 presented some evidence from Soviet sources which suggested that the apparat might range from 150,000 to 200,000. Merle Fainsod, How Russia is Ruled (Cambridge, Mass.: Harvard University Press, 1963), pp. 206-207. Thus, the party's professional apparatus is approximately four to five per cent of its total membership. The size of the apparatus has in all likelihood decreased during the last ten years. However, the total number of apparatchiki is substantially larger than the estimates cited above if one includes Soviet executive committee chairmen and yet others who are temporarily assigned to jobs in industry and elsewhere.

[50] John A. Armstrong, Soviet Bureaucratic Elite (London: Atlantic Books, 1959), Ch. 3.

The Party cadres, by both experience and formal education, are trained to be "professional political leaders of society, capable of providing expert social-economic direction within the framework of the ideological goals and political vested interests of the ruling Party."[51] The Party apparatchiki are both politicians, in the sense that they are experienced in organizing and manipulating the population and directing ideological and agitational activities, and professional administrators. Furthermore, these politician-administrators are above all generalists and trouble-shooters whose forte is coordinating the diverse range of activities within a region and stepping in to resolve administrative tangles and economic bottlenecks. They are normally intimately familiar with the economy of their area for they often assist or cajole industrial managers and farm chairmen directly.[52] Finally, they are used to working under extreme pressure. One of the prominent characteristics of the Soviet system is the overcommitment of resources. Output plans are set high and supplies are chronically short. Managerial failure can lead to swift demotion. Moreover, bonuses, which comprise an important part of management's income, are tied to plan fulfillment and overfulfillment.[53]

On the other hand, as a bureaucratic politician, the party apparatchik's authority derives from his organizational position, which in turn rests upon his capabilities and his relationships with his superiors. Although the local party secretary cannot be entirely callous to popular aspirations and morale, since his power does not derive from the populace, he is less concerned about his base of popular support than about his bureaucratic connections above. This means that he may feel freer to place pressing demands on the population and enforce them with compulsion if necessary; it probably also means his authority is less firmly

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[51] Brzezinski and Huntington, op. cit., p. 143.

[52] Gerry Hough, The Role of Local Party Organs in Soviet Industrial Decision-making. (Unpublished Ph D. dissertation, Harvard University, 1961.)

[53] See Joseph Berliner, Factory and Manager in the U.S.S.R. (Cambridge, Mass.: Harvard University Press, 1957); David Granick, The Red Executive (Garden City, N.Y.: Doubleday & Company, Inc., 1960); Raymond A. Bauer, Alex Inkeles and Clyde Kluckhohn, How the Soviet System Works (New York: Random House Vintage Books, 1960).

based in the mass mind than a politician whose legitimacy rests on the popular vote. It also suggests that the average local party secretary is more "bureaucratic" in outlook and action. He looks to his superiors for direction. He is more cautious and less willing to innovate. And he thinks primarily in organizational terms, i. e., manipulating the population through the well-known organizational techniques.

As a totalitarian regime bent on rapid social change, the Soviet regime has always placed a high premium on popular participation no matter how artificially mobilized by Western standards. With the decline of terror as a technique of rule, the regime has further expanded its efforts to rely on popular participation directed by political authorities. "Mass-organizational" activities are a major component of the Party apparatchik's responsibilities. A wide range of mass organizations has been created, running the gamut from trade unions, local soviets, sports societies, DOSAAF, and parent-teacher's associations to the Komsomol and the Communist Party itself.[54] The most important core of "activists" in the Soviet Union is of course the approximately 10.5 million communists and the 19.4 million members of the Komsomol.[55]

[54] Howard R. Swearer, "Popular Participation: Myths and Realities," Problems of Communism, IX, 5 (September-October, 1960), pp. 42-51. See also Swearer, Local Government in the Soviet Union: Public Participation in a Totalitarian Society, op. cit., Ch. 10.

[55] Pertinent geographical and functional characteristics of Communist Party members include the following:

National Composition of the Party, July, 1961

Russians	6,116,700	63.3 %
Ukrainians	1,412,200	14.7
Belorussians	287,000	3.0
Uzbeks	142,700	1.5
Kazakhs	149,200	1.6
Georgians	170,400	1.8
Azerbaidjani	106,100	1.1
Lithuanians	42,800	.44
Moldavians	26,700	.27
Latvians	33,900	.35
Kighiz	27,300	.28
Tadjiks	32,700	.35
Armenians	161,200	1.7
Turkmens	27,300	.28
Estonians	24,400	.26
Others	866,100	9.07

During a crisis, one would expect the local political leaders to rely heavily on this shock group to lead the mobilization of the population--as was done during World War II.[56]

Moreover, in the Soviet Union the political authorities have greater access to the individual since he is willy-nilly encased in a web of organizational controls. He works in a "collective," and carries an internal passport and labor

(footnote 55 continued)

Educational Level of the Party Membership, July, 1961

Higher Education	13.3%
Incomplete Higher and Secondary Education	29.6
Incomplete Secondary	28.6

Occupation Distribution of Party Membership in Territorial Party Organizations, July, 1961

Occupation	Per Cent
Industry and Construction	33.5
Agriculture and Forestry	23.3
Transportation and Communications	9.2
Procurements, Material-Technical Supply and Sales, Trade and Public Catering	5.4
Education, Science, Public Health, Culture	15.6
Apparatus of State and Economic Administration and Party and Public Organizations	10.8
Municipal Economy and Other Branches	2.2

Length of Party Membership

Years in Party	1961
10 years or less	40%
11 to 25 years	52
Over 25 years	8

Source: "KPSS v Tsifrakh," Partiinaya Zhizn', No. 1 (January, 1962), pp. 44-54.

[56]Leon Gouré, The Siege of Leningrad, pp. 72-73.

book. At home, he is subject to the regulations of a block or apartment house committee.[57] These numerous mass organizations are all plugged into the pervasive political command structure and hence are subject to rapid mobilization by the political authorities to enforce regulations and induce acceptable modes of behavior. They are not likely to resist Party direction; nor are they very likely centers around which politically dissident elements might coalesce. Most students of the experiences of the Soviet Union during World War II give considerable credit to these networks of controls in keeping the population in line. Not only is the individual largely defenseless against this organizational manipulation, he knows that deviant behavior may be lethal.[58]

The American Case. Governments in the United States have a bewildering number and variety of relationships, both vertical and horizontal, including: federal-state, state-local, federal-local, interstate and interlocal. Not only are these various relationships highly intricate and delicately balanced, but below the federal level, the number, variety and jurisdictions of local governments (i.e., state, county, municipal) are overwhelming.[59] City governments assume a number of forms, including strong and weak mayors, councils, commissions, city managers, town-meetings and various combinations of these.

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[57] During World War II in Leningrad and elsewhere block and apartment house committees were the major organizers of civil defense measures and supervised the enforcement of various emergency regulations.

[58] Black marketeers and looters were occasionally shot on the spot during World War II. See Werth, op. cit., p. 326.

[59] A few statistics indicate the complexity involved. In 1962 there were a total of 91,236 political units each with administrative and fiscal autonomy and some degree of public accountability. In addition to the federal government and the 50 states, there were 3,043 counties, 17,977 municipalities, 17,144 townships, 34,678 school districts and 18,323 special districts. The average per state amounted to 1,825 separate political units, but the actual numbers ranged from 6,453 in Illinois to 21 in Hawaii. See Municipal Year Book, 1964 (Chicago, Ill.: International City Managers' Association, 1964), pp. 30-39.

A majority of these political units exercise not only their own inherent or delegated powers, but also act as administrators for higher governmental units.[60] Such admixtures of function and responsibility highlight the intricate distribution of political authority in America. In each community, there are several levels of formal political authority, each deriving power and financial resources from a different source.[61] The effect is to create numerous autonomous or semi-autonomous bodies compounding the problems of coordination and cooperation.

Although local and state governments have been strengthened in recent years and have become more professional and effective, nonetheless they are typically weak and decentralized. Even more than in the case of the federal government, local governments were constructed so that they would be highly responsive to community interests and popular pressures. Thus, powers were divided and checked with a vengeance, and provisions were made for extensive access by the population in the policy-making process.[62] Where city political machines moved in to fill the power vacuum, they provided badly needed cohesion; but they have rarely been noted for their efficient, progressive, and professional administration in serving the public welfare.

In short, the multiplicity of governmental units creates and supports a highly delicate system of balanced authority and inter-governmental relationships. The essential feature of the political system from a macro point of view

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[60] An example of the mixed nature of governmental authorities is the role of states in the public assistance program. Many of the regulations are established separately in each state, but state administrators must also accept certain federal standards in order to receive the all-important federal financial contributions.

[61] Thus, for example, the welfare departments of the several states receive power both horizontally and vertically, from state and federal sources. Even more conducive to conflict is the pattern of multiple localized authorities. Once thought to increase efficiency and responsiveness, the proliferation of special districts has increased the difficulty of establishing overall lines of governmental authority.

[62] As Edward Banfield has put it: "The general idea seems to have been that no one should govern, or failing that, that everyone should govern together." Edward C. Banfield, "The Political Implications of Metropolitan Growth," Daedalus, LXXXX, 1 (Winter, 1960), p. 69.

is the absence of institutionalized, centralized decision-making apparatus on any level. This dispersion of governmental power is only rarely ameliorated--and then in strictly limited geographical areas--by the existence of a cohesive political party. Finally, in comparison with the Soviet Union, broad areas of social life are designated as private and beyond direct political control (although, of course, this is less true than 30 years ago).

Fragmented institutional authority was, in the earlier history of the nation, offset to some degree by the informal concentration of community power in the hands of an oligarchy, or later, political bosses. The power of the latter has been gradually dispersed, in part to professional administrators, in part to influential individuals and community groups. Studies of community power structures reveal a fragmentation and specialization of decision-making groups and individuals.[63] Competing and shifting centers of personal, economic and social power characterize the political process in American communities.

Lines of community authority are blurred as a result of the dispersal of power, the pluralistic nature of the society, the relatively limited scope of governmental jurisdiction and the existence of competing political parties, as well as the tradition of self-initiated activity by various non-governmental, economic, social and public service organizations. Unlike the Soviet case, formal governmental positions may not be a reliable gauge of an individual's power. His authority on a variety of issues may well be challenged by powerful private groups or influential private citizens (whose economic and social standing may eclipse that of the office-holder). Even when problems reach a crisis stage, a local office-holder may be unable or unwilling to act forcefully because of legal limitations on his jurisdiction,

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[63] In his study of New Haven, Robert Dahl concluded: "Probably the most striking characteristic of influence in New Haven is the extent to which it is specialized, that is, individuals who are influential in one sector of public activity tend not to be influential in another sector." Robert Dahl, Who Governs (New Haven, Conn.: Yale University Press, 1964), p. 169. Many other studies have reached similar conclusions. See, for instance, Harry Scoble, "Leadership Hierarchies and Political Issues in a New England Town," in Morris Janowitz (ed.), Community Political Systems (Glencoe, Ill.: The Free Press, 1961).

or because he is wary of arousing powerful vested interests or running afoul of democratic values concerning representative leadership.[64]

Possible Soviet and American Responses to Thermonuclear Disaster. If, as every disaster study reveals, a major disaster immediately places a premium on authoritative and decisive leadership, increases the scope of governmental activities and dramatically multiplies the burdens placed on the political system, how might the American and Soviet political institutions respond in the short run to a nuclear disaster?[65]

Given the tradition in the Soviet Union of intense political direction of society, greater--at least overt--popular submissiveness to political authority and the priority of collective over individual interests and aspirations, one would expect the civilian population to look to political leadership for direction more than in the American case. Compared to the United States there would probably be less disputation of the policies of the political authorities and less attempt by individuals to assert their rights and interests against those of the community. Such attitudes would facilitate control by local authorities. Moreover, the latter have at their disposal powerful organizational levers to control the behavior of the individual and would have more precedent for using force to back up their decisions than would their American counterparts. Finally, local authorities would most likely be immediately and clearly identified by the community.

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[64]The sheriff and other local officials of Galveston County refused to follow the standard pattern of communities struck by Hurricane Carla in 1961 and never did order evacuation of his area. One official candidly stated, "Politics is one of the biggest problems involved in evacuation. Remember that a sheriff has to be elected every four years, and when he forces someone to evacuate he is not making friends." In another county the sheriff waited until after almost all resident had departed voluntarily before he issued an evacuation order. Harry Estill Moore, et al., Before the Wind (Washington, D.C.: National Academy of Sciences--National Research Council, 1963), p. 141.

[65]Police and fire departments, state police and the military have good records in handling natural disasters. Analysts have attributed their successes to their organization and training and to their clearly defined and recognizable roles in the community.

On the other hand, the population would be less likely and able to undertake unguided individual and community self-help activities. Local authorities might be overwhelmed with the immensity of the rescue and recovery job; and, as a consequence, mobilize the population for jobs which would not prove to be the most efficient or helpful.

In the United States it is generally assumed that the primary local official--whether he be mayor, city manager or state governor--would assume leadership in the event of nuclear disaster.[66] Because of the nature of the power structure in American communities, the complex set of governmental relationships and the fact that there are neither uniformly recognized institutional bases for authority nor dominant individuals whose authority is clearly recognized by all, the establishment of local leadership is subject to more uncertainties and limitations than in the Soviet Union. Moreover, the tradition of individualism and the belief in the right--indeed the desirability--of the individual to fend for, and protect, himself and his family may severely jeopardize the authority of local leaders, especially when their decisions may mean life or death for many.

On the other hand, the American public would probably be more adept at organizing itself into various rescue and recovery operations, thus lessening the direct load placed on the political leadership (although coordination would still be vital); and the spirit of community self-help and mutual suffering would probably dampen disruptive rebellion against authority.

Civil Defense and Vulnerability Reduction

The Soviet and American Cases. Before discussing post-attack recovery of two such divergent systems as the United States and the Soviet Union, an extensive caveat must be inserted to emphasize that pre-attack civil defense preparations will profoundly influence the course and magnitude of the recovery effort. It is necessary to describe the salient political-institutional characteristics of civil

[66] See American Municipal Association, Organizing Municipal Governments for Civil Defense (Washington, D.C.: American Municipal Association, 1963), Part I, pp. 13-14.

defense planning in the two countries, although we cannot know for certain whether in fact civil defense will be capable of protecting people, to say nothing of institutions or values.

Both American and Soviet civil defense programs closely reflect the respective societies they are designed to protect. The Soviet civil defense program is an integral part of the political system. There appears to be a centralized civil defense plan which gives first priority to the protection of administrative, technical and scientific personnel and facilities. It also seems reasonable to assume that some safeguards have been taken to preserve important records and documents. As with all Soviet programs, compulsion supports civil defense, if not in regular practice, then as a potential assist whenever and wherever the regime deems it necessary. To enhance control and ensure continuance of authority, the chief civil administrator in an area, or the director of an enterprise or institution, is likely also to be in charge of civil defense implementation. In accord with the collectivist nature of the society, as reflected not only in industrial organization but also in the overwhelming percentage of urban housing that is supplied by large apartment complexes, shelters have been designed almost wholly for large groups of people.[67]

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[67] Evidence indicates the predominance of shelters for 150 or more persons. "They include shelters and cover built into the basements of apartment houses and public and other buildings...". (Leon Gouré, Civil Defense in the Soviet Union. Berkeley, Calif.: University of California Press, 1962, p. 79 quoting Uchebno-metodischeskoe posobie po provedeniiu trenirovok i priemu norm "Gotov k PVO" 1-i stupeni, Moscow: DOSAAF, 1959.)

> "Although family shelters do not appear to constitute an important part of the Soviet shelter program, they are occasionally referred to as being suitable for the use of suburban residents... In view of the scant attention they receive in Soviet civil defense literature, family shelters are unlikely to be given much prominence in the over-all shelter program. Moreover, individual families would find the procurement of building material, labor, and financing for such private construction fraught with many difficulties and obstacles, not to mention that a Soviet homeowner may be dispossessed without compensation if the city authorities decide to use the area of his property for other kinds of construction. As family shelters are entirely voluntary ventures, few persons are likely to have the necessary money and influence to build them."
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> (Ibid., pp. 91-93.)

Leon Gouré has studied the published Soviet civil defense materials and the visible indicators of preparations and concludes there already is an effective program; but no one outside the Soviet elite can know authoritatively how elaborate and extensive these preparations really are. The quality of Soviet civil defense depends primarily on the priority accorded it by the leadership, a judgment that is most tellingly expressed in terms of personnel, resources and the energy of local administrators diverted to the program. That is to say, there are no serious institutional barriers to developing a comprehensive civil defense program, for it can be dovetailed into the many other functions of the Party-state-mass organizational complex. The emphasis on mass organizations is reflected in assignment of civil defense responsibilities to DOSAAF, which works through factory groups, trade unions, block and housing administrators and committees.[68] Any brake on

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[68] DOSAAF is Dobrovolnoe obshchestvo sodeistviia armii aviatsii i flotu, the organizational arm of the MPVO, the governmental organ responsible for civil defense. DOSAAF claims 30 million members, making it the largest "voluntary" organization in the U.S.S.R. See Gouré, Civil Defense in the Soviet Union, op. cit., Ch. 3.

After the completion of this manuscript, additional information on the Soviet civil defense program was provided by Marshal V.I. Chuikov in an interview with the Novosti Press Agency which was published on March 17, 1965 in many local Soviet newspapers (but not in Pravda). Chuikov began by placing civil defense in a broad strategic context by showing how, in the thermonuclear age, civil defense is an integral part of a nation's overall military posture. He asserted that, "We communists--thoroughly evaluating and not belittling the possible consequences of a rocket-nuclear catastrophe--firmly assert: humanity and world civilization will not disappear, but, if such a destructive war is thrust on us it will lead to the final destruction of capitalism as a socio-economic formation and to the victory of the new, progressive socialist system." He pointed out, however, that this prophecy depended upon proper preparations, one of the most important of which is civil defense: "To preserve in the course of the war the population--the main productive force, and also the most vital of the economic and material-technical resources--this is now a task of primary state importance."

After briefly reviewing Soviet civil defense during World War II, the Marshal then outlined the expected character of thermonuclear war, stressing the element of surprise and the generalized nature of destruction. He then concluded:

> "Thus, such conditions in which we may visualize the country in contemporary war, also have led to the necessity of changing the local anti-aircraft defense into a new organization--civil defense, bearing an all-state, national character. Its goal is not local defense of separate cities and districts, but defense of the country, its population and the national economy of all citizens.

an extensive civil defense program in the Soviet Union is most likely to be budgetary, and would be determined by the regime's estimate of relative returns according to what it considers the most probable patterns of attack or the probability of any attack at all.

The American civil defense program, likewise, is fundamentally affected by budgetary considerations but it is also shaped by the federal system of government, the continuing importance of state and local governments and the ethos of individualism. The 1950 Federal Civil Defense Act assigned the federal government only guiding and coordinating authority for civil defense; operational responsibility was left to the states and their political subdivisions. In 1958 new legislation recognized joint federal-state responsibility, but emphasis was still placed on the coordinating and guidance role of the federal government in contrast to the operational responsibilities of the states and communities. To encourage state and local civil defense programs, in January, 1961, the federal government was empowered to provide matching funds for states and localities in support of the civil defense administration, supplies, personnel, emergency operating centers and training courses.

(footnote 68 continued)

> Now in the Soviet nation, at all enterprises, industrial centers, in cities and rural localities organizations of civil defense have been created. Their basic task is the preparation of the population for defense from the means of mass destruction. They work in close contact with organs of local power, leaders of enterprises and public defense-mass organizations. . . .
>
> There are now sub-units and sections of the organs of civil defense--these are strong points in the defense of the population against radiation and other destructive elements of thermonuclear weapons. Around them are being created mass formations of the civilian population to be ready for action in the case of nuclear war."
>
> (Kazakhstanskaya Pravda, March 17, 1965)

The New York Times Moscow correspondent, Theodore Shabad, in a New York Times story on March 17, 1965, p. 3, interpreted this statement to mean that the Soviet civil defense establishment had recently been centralized. The quotations cited above do, indeed, indicate the existence of a centralized civil defense establishment with sub-divisions in localities; but it is not clear when this agency was created or whether Chuikov's interview signifies a recent change in Soviet civil defense policies. Shabad's further deductions, however, that the civil defense agency is part of the Ministry of Defense and that Chuikov is its likely director, seem reasonable.

Thus, the role of the federal government in civil defense has been gradually expanding, partly because the response of state and local governments to the challenge has been inadequate, and partly because since 1960 it has become increasingly apparent that civil defense is an integral part of our national defense posture. The then Assistant Secretary of Defense for Civil Defense, Steuart L. Pittman, stated a major premise of the American civil defense program at that time when he told the House Committee on Government Operations in 1962: "We are looking, the Federal Government is looking to the State governments and county and city governments to take this responsibility...Specifically, our intentions are to do everything possible to cooperate with State and local governments in their efforts to meet these responsibilities, rather than to have a visible and ready alternative of Federal or military resources to throw into the breach...."[69]

A study of civil defense preparations by municipal governments conducted by the American Municipal Association in 1963 indicated considerable disarray in municipal civil defense preparations and pinpointed the major difficulties in the program. It summarized its findings as follows:

> City chief executives, administrators, and civil defense officials are not satisfied with the present condition of their civil defense readiness. They are almost unanimous in their desire for more positive direction and leadership from state and federal authority. They have experienced frustration in building their local civil defense programs because of rapid changes in national program and doctrine, the absence of effective state programs in many states, and, except during periods of unusual international tension, public apathy. Rapidly rising costs of local government, the need to provide increased services and undertake major programs of community development, and severely limited sources of revenue, have all combined to restrict the commitment of city resources to civil defense.[70]

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[69] United States Congress, House of Representatives, Committee on Government Operations, Hearings: Civil Defense--1962, 87th Congress, 2nd Session, 1962, Part I, pp. 161-162.

[70] American Municipal Association, op. cit., p. 1.

The study suggests a wide range of factors inhibiting the development of municipal civil defense programs; a number are relevant to this paper since they touch on political and administrative arrangements.[71] It is useful to list several of these factors in order to show how they relate to the previous general characterization of the American political system.

City governments are often too weak and decentralized to provide effective direction of the municipal civil defense program--especially in commission and "weak-mayor" cities. Even in the more unified and stronger city governments, such as the council-manager type, however, professional administrators find it difficult to seek adequate civil defense appropriations from popularly elected city bodies such as the city council. Efforts to develop volunteer and auxiliary forces have not, on the whole been successful for it is difficult to recruit, train and retrain volunteers over long periods of time, especially when there is normally no pressing need for their services. Basing local civil defense organizations on the existing large number of local governmental units, instead of creating larger regional civil defense organizations, has led to partial, weak and inadequately financed programs, and has created civil defense jurisdictions unrealistic for the burdens of a nuclear disaster.[72]

One of the major conclusions to be drawn from the report is the need for greater federal direction and financing of civil defense, not just through the states but also directly in cooperation with local authorities.[73] In many instances, state governments have not adequately assisted local governments, nor have they taken proper measures for their own protection.[74]

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[71] Ibid., pp. 1-9.

[72] Ibid., pp. 8-9. A strong local civil defense program is especially important in view of an assumption of the municipal civil defense program: that localities must be able to proceed with immediate post-attack and recovery operations on their own for at least one month after a nuclear war.

[73] Increased regional or area-wide responsibilities could provide one mechanism for reaching from the federal to the local offices.

[74] State civil defense expenditures fluctuate greatly from year to year. They totalled $16,982,000 in 1955, a low of $7,855,300 in 1960, and $10,805,000

In addition to the growing federal involvement in the program, in recent years the role of the military in civil defense has also been recast. The traditional military attitude toward civil defense was expressed by General Maxwell Taylor in 1956 in testimony before Congress:

> I sincerely hope that this committee and the country is not depending upon the Army under this kind of thing, we are not prepared for it, we are not big enough for it and then it conflicts with our primary role of combat. . . .[75]

Since that time, civil defense doctrine has been modified so that greater participation of the military is anticipated, partly because there is a growing recognition of the inadequacies in the civilian program.[76] The military command has also become somewhat less reluctant to accept responsibilities in civil defense. Domestic vulnerability appears increasingly to be recognized as directly related to strategies in the nuclear age; and, moreover, domestic recovery may be the most important mission for some forces in the event of a nuclear war.[77] The greater involvement of the military in civil defense is symbolized by the placement of the civil defense program--as distinct from the Office of Emergency Planning--under the Department of Defense (currently under the Secretary of the Army).

(footnote 74 continued) in 1961. Council of State Governments, Book of the States (Chicago, Ill.: Council of State Governments, 1964), p. 475. In 1962, twenty-four states had well-protected emergency operations centers; eight more had such centers with fallout protection; thirteen others were in the planning process. Ibid., p. 472. Twelve states in 1962 did not have legal provisions for succession to leadership posts in case of disaster. Ibid., p. 474.

[75] United States Congress, House of Representatives, Committee on Government Operations, Hearings: Civil Defense for National Survival, op. cit., p. 444.

[76] For a general statement of current thinking and doctrine on the role of the military in civil defense, see Robert Lamson, "The Army and Civil Defense," Military Review, XLIV, 12 (December, 1964), pp. 3-12.

[77] A Department of Defense directive actually reads:

> It is possible that damage will be so extensive as to require evaluation as to the priority to be assigned to the needs of civil recovery as opposed to military requirements for military forces overseas.

United States Department of Defense, Directive Number 3025.10, April 23, 1963.

The Army's civil defense role, however, is limited by lack of available personnel and because its primary function is considered to be the combat mission. There is another serious consideration, however, particularly pertinent to this paper, in discussing the Army's civil defense mission: civil-military relations. The tradition of military subordination to civilian government is deeply rooted in the United States; both the military and the government are wary of disturbing their traditional roles by anticipating the necessity of widespread military government at the local level in the event of attack. The unhappy experience of Operation Alert in 1955 directly raised this embarrassing and knotty conundrum because it resulted in the partial (and confused) imposition of martial law.[78] The likely result, according to one expert, Harvard law Professor Charles Fairman, would have been:

> All these directives would suddenly be routed over to the Department of Defense, to go down through the Department of the Army, the Continental Army Command... the respective Army headquarters of the six armies, perhaps on to the military district headquarters in the several States, and so to the governor.... To exercise martial law the Army would require a huge increment of civil affairs officers... Where would these civil affairs officers be recruited?... This utterly Herculean task calls for the special competence of men skilled in public leadership and administration, in business and industry, in ministry to the human and spiritual needs of stricken men. It is not primarily a task for military authority. I repeat, there are many operations that the Army could most usefully perform: but the basic problem is governmental and economic, not military. It calls for civil leadership rather than for military command.[79]

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[78]The Presidential proclamation read: "The Secretary of Defense and subordinate military commanders...shall carry out determinations and decisions of Federal agencies...and the proclamations and Executive orders issued since the attack." See United States Congress, House of Representatives, Committee on Government Operations, Hearings: Civil Defense for National Survival, op. cit., p. 280.

[79]Ibid., pp. 292, 310.

Fairman's view is supported by data that indicate military capabilities would be limited as compared with the potentials within the civilian population. In 1964 Congressional testimony, Secretary of the Army Ailes stated:

However, the military must always be prepared for the total breakdown of civil authority. In that case, military units are trained, "under conditions where civilian control is no longer effective, to assume such control until relieved by higher military authority or until effective civilian control is established."[80] In view of the Operation Alert difficulties, many potential ramifications of military involvement in civil defense are neglected by such vague formulations. As just one example, in the instance that military government in a locality is necessary, by what means will civil authority be re-established, and who will determine that it is legitimate? If the Army is likely to play a role in civil defense, rather detailed plans should be made to promote and implement joint planning between lower military and civil defense authorities so that in an emergency roles will be relatively clearly defined.

(footnote 79 continued)

> Our armed forces must retain their capability to deal with military threats: The military forces and resources based in this country, even if committed entirely to civil defense operations, could not cope with the requirements since these forces represent less than three percent of the Nation's manpower and equipment potential.

United States Congress, Hearings before the House of Representatives Appropriations Subcommittee on Independent Offices, 88th Congress, 2nd Session, 1964, Part II, p. 1499. Figures given in 1960 continue to be suggestive: reserves, including standby and retired members, included 4 million, as compared with the 10 million involved in civil defense in World War II. United States Congress, Senate Armed Services Committee, Hearings: Assistance to Civil Defense by Reserves, 86th Congress, 2nd Session, June 1, 1960, p. 22. As reported in Army magazine, the Secretary of the Army wrote to state governors on April 1, 1964, to ask them "to comment on a plan that would give the Army a military headquarters in each state for more effective planning and control of military support of civil defense". "States Learn of the Army's Civil Defense Plan," Army, XV, 1 (August, 1964), p. 17. According to this account, the military role would continue to be that of supporting and not replacing civil participation. Although Federal civil defense has come under the Secretary of the Army's direct jurisdiction only comparatively recently, it is nevertheless noteworthy that as late as 1964, the Army lacked effective state military headquarters for directing participation in civil defense activities.

[80] Department of Defense Directive 3025.10.

As an alternative to such drastic action, the military is currently emphasizing its support role in regard to civil authority. Military responsibilities in this case would be to provide specialized services for local communities and states. Qualified teams of medical, firefighting, rescue, ordnance and other needed personnel and supplies would be sent to assist when requested by the civil authorities.[81]

The burden of the argument in this section is not that the American civil defense program is a complete failure or, necessarily, that it is less effective than the Soviet program (we simply do not have the information about the Soviet program to make a qualitative comparative judgment). What is suggested, is that American political institutions and values make the development of a comprehensive, well-integrated and effective program difficult, especially if that program is designed to buttress current institutional structures in case of nuclear attack.[82] Particularly crucial are the relations between the federal, state and local authorities and those between the military and civil governments, not only as they influence civil defense preparations but also institutional recovery after attack. Vague and undefined relationships and plans will increase the vulnerability of institutions, especially in the short run.

IV. Survival and Recovery of Political Institutions

We have characterized the Soviet and American political systems and indicated some of the implications of their nature and major features for civil defense preparations and recovery in the short run. In this section we turn to a consideration of longer ranged recovery, that is, an attempt to picture some of the evolutionary

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[81] The requirement that all personnel and supplies will continue under military command might make even this relationship a complex and trying one.

[82] American values may be used to rationalize inaction in certain areas. For example, the value placed on individual initiative--coupled with the predominance of single-family housing units--supported a line of argument voiced in the late 1950's which avoided facing up to the admittedly difficult task of providing adequate shelters by stressing the responsibility of individual families to build and provision their own shelters.

adjustments resulting from the necessities of dealing with immediate needs for physical survival. Two lines of analysis and argument are presented. The first deals with the relationship between the degree of "modernization" and industrialization of a society and its recovery capabilities. The second attempts to add a dynamic dimension to the consideration of recovery by placing the anticipated imperatives of the recovery process in juxtaposition with discernible evolutionary trends in the two societies during recent decades.

Degree of Modernization as Related to Recovery: The Soviet and American Cases Compared

In the following pages we shall investigate the relationships between levels of "modernization" and vulnerabilities to nuclear attack. In the author's opinion evidence and logic suggest that the more modernized the society the greater long-term capacities it harbors for recovery from widespread devastation; nevertheless, in the short-term, post-attack period, there may be a comparative advantage in being relatively less developed. However, since the considerations involved are so complex and difficult to evaluate, it seems the better part of wisdom to marshall what appears to be the relevant evidence without attempting to draw definitive conclusions.

Although severely damaged, the more industrialized the country and the more widely distributed the industrial plant, the larger the pool of repairable capital that would remain. A nation with a high ratio of industrial resources to population before attack would retain the comparative advantage over a less industrialized society if levels of attack are constant. Similar points could be made in regard to the fund of technological, scientific and organizational talent and skilled labor.[83] The more economically advanced country, similarly, enjoys a

[83] As partial and indirect empirical verification for this proposition, one could point to the experience of the post-war American economic aid program. The amazing results of the Marshall Plan in stimulating the economic "miracle" of Europe in the 1950's compared to the much less satisfactory results of economic aid in Asia, Africa and Latin America, attest to the greater ease of restoring a damaged economy, even one badly damaged, than of developing an industrial society from a low base line.

higher degree of scientific, technological and administrative redundancy and unused economic potential, along with a larger stock of reserves. Hence, its absolute level of well-being and the recovery potential after an attack would normally be higher than that of a less developed country.[84]

On the other hand, as suggested earlier in this paper,[85] in some respects the more economically and administratively modernized a society, the more vulnerable it is to nuclear attack, especially in the short run, both because of the complexity and because of the expectations among the population. A substantially larger rural-oriented population, an economy with less automation and a less finely calibrated series of economic interrelationships and a less highly differentiated bureaucracy with less role specificity, as indicated below, are all factors that may actually aid short-term institutional recovery ability.

Urbanization as a concomitant of development illustrates one aspect of the problem. Not only does urbanization potentially expose more people to the immediate effects of nuclear attack, but it also magnifies the administrative and

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(footnote 83 continued) As Ansley Coale has written:

> "The greater dispersion of skills and education through the population and the existence of a better developed and higher capacity network of communication and transportation mean that in a highly industrialized economy the reaction to disaster is more likely to be purposeful and efficient than under more primitive circumstances."

Ansley Coale, "Population Research and the National Interest," in Ithiel de Sola Pool, et al., Social Science Research and National Security (Washington, D. C.: The Smithsonian Institution, Research Group in Psychology and the Social Sciences, 1963), p. 170.

[84] Research on the effects of World War II showed the comparative disadvantages of relatively low standards of living as measured by such indicators as housing density. A developing society is likely to have a severe housing shortage, which means that unless many more people than buildings are destroyed, the crowding is likely to increase most uncomfortably. The important element here is the elasticity of resources. See Fred Iklé's discussion of this factor in The Social Impact of Bomb Destruction (Norman, Okla.: University of Oklahoma Press, 1958).

[85] Cf., e.g., pp. 469-475.

logistical problems in recovery. Disruption of the intricate distribution system, used to provide necessities as well as luxuries, will create more real and psychic deprivation than in societies where living standards have been lower and distribution systems more primitive; moreover, severe disruption is far more likely in an intricate distribution system with many interlocking parts than in a relatively simple one characterized by multi-purpose organizations with a low degree of specialization. Second, the more urbanized the population, the more extensive and the more difficult will be the likely spontaneous and directed redistribution of the population. Many people could be expected to migrate from the cities to rural areas and small towns because of destruction and breakdown in the distribution system in urban centers. This transplantation would be more difficult for the highly industrialized society, not only because of the larger numbers of migrants involved, but because the bulk of the city population would be several generations removed from rural life, would possess few family and personal ties in rural areas to assist in relocation and would lack skills and habits readily adaptable to rural environs.[86]

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[86] In 1960 the Soviet urban population constituted 51% of the total as compared to 70% in the U. S. In the same year, 29% of the population of North America lived in cities of 100,000 or more compared to 18% in the U. S. S. R. See Murray Gendell and Hans L. Zetterberg (eds.), A Sociological Almanac of the United States (Totona, N. J.: Bedminster Press, 1963), p. 91.

Of importance also is the relatively recent origin of much of the Soviet urban population, which is suggested, in part, by the following table which shows the number of urban communities in 1939 and 1959:

NUMBER OF URBAN COMMUNITIES, 1939 and 1959

All Urban Communities	1939	1959
(Size of Community)		
Under 3,000 persons	467	849
3,000-5,000	531	887
5,000-10,000	757	1,288
10,000-20,000	501	810
20,000-50,000	315	483
50,000-100,000	99	151
100,000-500,000	78	123
Above 500,000	11	25
Total:.....	2,759	4,616

Source: Pravda, May 10, 1959, pp. 1-3.

A second possible disability of the more modernized nation in the face of general disaster, and one more central to the focus of this paper, is the higher degree of specialization and differentiation of its institutions. While increasing inter- and intra-institutional specialization and differentiation enable a society to handle a greater number of tasks, they also add to the complexity of the relationships within and among institutions and increase the burdens of coordination. In normal times coordination is largely decentralized and spontaneous, being based on contractual relationships within a competitive market framework. (Although the terminology is borrowed from economics, the substantive point is applied to the entire society.)[87] Under tremendous stress these market relations would be at least partially disrupted.

While the degree of institutional specialization and differentiation is in part a function of industrialization and modernization, it is, of course, also affected by other factors, some general and some unique to a particular society. For example, an intense drive for industrialization by a society which is attempting to

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(footnote 86 continued) Of course, an increase in the number of urban communities does not, standing alone, necessarily show a marked increase in the degree of urbanization of the total Soviet population. That the increase in the number of cities and towns was not due solely to general population growth, but rather to the fact that a higher percentage of the population has been living in urban areas, is suggested in Congressional testimony by James W. Brackett:

> "According to official Soviet estimates, the urban population increased by 3.8 million during 1959, 4.5 million during 1960, and 3.5 million during 1961--a total of nearly 12 million in 3 years. The average annual rate of increase in the urban population, according to the official estimates, was 3.8 per cent--2.3 times the officially reported growth for the country as a whole."

United States Congress, Joint Economic Committee, Hearings: Dimensions of Soviet Economic Power, op. cit., p. 513.

[87] For a brilliant and thought-provoking analysis of "organizational" and "market" societies, see T. H. Rigby, "Traditional, Market, and Organizational Societies and the USSR," World Politics, XVI, 4 (July, 1964), pp. 539-557.

"catch up" implies at least initial greater guidance by the central government.[88] American social, political and economic institutions are also more variegated because they developed under conditions of private property, the economic marketplace, favorable natural resources and a liberal political philosophy. National policies and trends of societal development in the U. S. have not been so much the result of determinations of the federal government as the aggregation of hundreds of thousands of autonomous decisions made throughout the society. Finally, the economy has been consumer-oriented.

Such a society is a highly intricate and sensitive mechanism with many delicately balanced parts. The relative abundance of American society can in large measure be attributed to this "market society"; but a nuclear disaster, especially in the short run, would be very disruptive. American society is highly integrated and interdependent and thus heavily reliant on well developed and comprehensive transportation, distribution and communication systems. These systems would be seriously impaired by nuclear attack.[89] Moreover, private

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[88]Alexander Eckstein has observed that:

> "The urge for massive state intervention in the process of economic and industrial growth will be the stronger 1) the greater the range of ends and the higher the level of attainment sought; 2) the shorter the time [allowed]. . .; 3) the more unfavorable the factor and resource endowments; 4) the greater the institutional barriers to economic change and industry; 5) the more backward the economy in relative terms."

Alexander Eckstein, "Individualism and the Role of the State in Economic Growth," Economic Development and Cultural Change, VI, 2 (January, 1958), p. 83.

[89]Scott Greer and Robert Winch apply a line of reasoning similar to that expressed here in their discussion of the relative vulnerabilities of the small town and the metropolis:

> "We find, at the macro-level, that the small-scale Type I local area (whether open country neighborhood, hamlet, small town or local area within the metropolis) is in the short run extremely flexible. It is flexible because the same people can do different things or, from another point of view, different kinds of people can be substituted for the same sorts of jobs. In the longer run, however, it is a rigid system, because it is a system in which there is little exchange

ownership of the economic resources and the highly developed legal system which buttresses both the market society and private property would be particularly sensitive to nuclear devastation.[90] The destruction of records and questions of financing reconstruction of damaged capital will raise serious problems.

Less institutional differentiation and role specialization in the Soviet Union is the product both of the fact that the Soviet Union began the industrialization process at a later stage and that it has not proceeded as far along the path of all-round modernization. In addition, the organizational character of the Bolshevik movement, the comprehensiveness of its goals, plus threats to the regime--both internal and external--during much of its reign, have reinforced the organizational or command aspects of the society and retarded market elements. The most egregious example of the organizational society is the Communist Party itself, especially its professional staff. The party cadre are omni-competent professional politician-administrators who perform a function of overall coordination. The individual party apparatchik is a generalist who is frequently switched from one post to another. His professional competence is not confined to a narrow field; rather, he is a specialist in coordination, manipulation and expediting.

(footnote 89 continued)

> capacity with the remainder of the society. The kinds of exchange that we have in mind are exchanges of social control, of human resources (population) and of material resources.
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> "... Contrariwise, the larger scale population, in the short run, is more rigid and vulnerable. It is so terribly dependent upon exchange relations outside the local area that it has a very difficult task adjusting to the many different functions which devolve upon the specific local area population. However, in the long run such populations are probably more flexible and able to face the job of reconstitution in the society."

Scott A. Greer and Robert F. Winch, Kinship and Voluntary Organization in Post-Thermonuclear Attack Society: Some Exploratory Studies (McLean, Va.: Human Sciences Research, Inc., 1965), p. 20.

[90] It is more than symbolic that there are so many lawyers in the United States compared to the Soviet Union and that in the latter country the lawyer has little prestige or power.

The Soviet economy as a whole is also less complex and sophisticated than the American. While disruption of the planning-command system in the event of nuclear disaster would seriously impair the economy, Soviet enterprises might be better able to cope individually with the emergency than their American counterparts; for despite the centralization of industrial administration, the Soviet enterprise is more self-reliant in the sense that it performs more stages of the production process itself and provides more of its own services and maintenance work rather than subcontracting or otherwise relying on outside support. Such practices may be inefficient and duplicative (as Soviet economists themselves realize), but in a disaster they could prove to be a hidden source of strength. Tendencies toward greater unit autarchy and a lower level of inter-unit relationships compared to the United States result from the difficulties of centrally planning a highly fragmented industrial plant and the fact that the Soviet economy has not traditionally been consumer-oriented.[91]

An additional factor leading to greater enterprise self-reliance has been the extreme shortage of supplies that is the inevitable result of operating an economy at full throttle. Under such conditions, no manager wishes to be too reliant on deliveries from elsewhere. Consequently, Soviet managers, although circumscribed by operations of the command economy, nevertheless have demonstrated considerable resourcefulness in meeting the pressures from above for production by sometimes dubious and officially deplored measures. The use of influence (blat), hoarding, arranging illegal or semi-legal barter deals and still other practices are widely employed.[92] Again, such experience might prove useful in the wake of a nuclear disaster. Indeed, Soviet managers are, on the whole, a rugged, hard-driving breed who have been technically trained and have had on-the-job experience in the line operations of the plant. It is a moot question whether American

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[91]For an excellent general treatment of the Soviet economy with a particularly perceptive analysis of its institutional make-up, see Alec Nove, The Soviet Economy: An Introduction (New York: Praeger, 1961).

[92]J. Berliner, op. cit.

managers (as distinct from entrepreneurs) would be more enterprising and resourceful than Soviet in the event of disaster.[93]

Long-Term Political Recovery

We now turn to a discussion of longer-range recovery and possible patterns of institutional change over a period of years. At least two sets of considerations are involved: the number and the nature of the burdens placed on the political systems by the disaster in both the short and long run; and the evolutionary tendencies currently operating in the two political systems.[94] If the burdens would tend to support evolutionary trends, one might anticipate their acceleration;[95] on the other hand, if post-disaster demands run counter to these trends they might be temporarily reversed or at least slowed. It is my contention that the former situation more nearly characterizes the American case and the latter the Soviet.

The American Case. The pressures of changing economic and social conditions, gradual mutations in values, growing democratization, and the demands of international politics have been altering American political institutions along several lines during the last half century. American politics and government at

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[93] For a comparison of Soviet and American managers, see David Granick, op. cit.

[94] The purely physical effects of nuclear attack provide the basis for the reader's independent evaluation of what demands will impinge on governmental institutions. A very thorough discussion is found in United States Congress, Joint Committee on Atomic Energy, Hearings: Biological and Environmental Effects of Nuclear War, 86th Congress, 1st Session, 1959. Neil Smelser, in his working paper that introduced this series, has examined some of the independent variables that will arise from the situation described in the Hearings. See Smelser, op. cit., Ch. II above.

[95] Just one example from disaster research is quoted to illustrate this point. "When Hurricane Audrey struck, Cameron Parish [Louisiana] had just undergone a major series of changes which made future change inevitable." Governmental services, such as garbage collection, a municipal water supply system, street lighting, were instituted after the hurricane in response to the dramatic needs which had actually been building up for years. See F. L. Bates, et al., The Social and Psychological Consequences of a Natural Disaster (Washington, D. C.: National Academy of Sciences, National Research Council, 1963), pp. 93ff. The quotation is from page 112.

all levels have become more nationally oriented and less parochial in outlook and format. A number of political and administrative subdivisions established well over a hundred years ago are feeling the pressure of mounting economic and demographic problems.[96] The appointed professional administrator has increasingly encroached on the territory of the elected semi-professional politician, both at the national and local level. Some two-thirds of our smaller cities are now run by professional managers and the mayors of large cities have much better staff assistance than they did twenty-five years ago.[97] The responsibilities and powers of the federal government, and especially its executive branch, have greatly expanded both directly, and indirectly through joint programs with the state and local governments. Finally, the role of government, in general, has increased in society.

It is part of the nature of American processes that these changes have been piecemeal, halting and ill-defined. There is a time lag between changing social and economic conditions and the adjustive response of political institutions; the more rapid the underlying change, the more out of kilter the political institutions. Vested political interests, the pervasive legalism in American attitudes and social processes, tradition, and the inherently conservative nature of American political processes designed to channel and temper change, all account for this gap between the burdens placed on the political system and its capacity to handle them.[98] A process of gradual adaptation, of course, has the advantage of

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[96] As one authority on metropolitan government has noted:

> "...polluted air and water, crime and fire and hydrogen bombs, are no respecters of our divided jurisdictions. Indeed, fragmentation may increase our vulnerability; the juvenile gang which takes care never to be booked in the home community cannot be identified if no central records exist...."

Scott Greer, Governing the Metropolis (New York: John Wiley and Sons, 1962), p. 114.

[97] Banfield, op. cit., p. 71.

[98] For a useful summary of the inhibitors to needed structural changes found specifically in metropolitan government, see Greer, op. cit., pp. 124-125. Greer, inter alia, argues forcefully that the "Jacksonian ideology" of radical

avoiding costly errors which might be incurred by rapid and sweeping change; and, by maintaining continuity, it generates popular consensus behind political institutions and thus legitimizes them. Nevertheless, from the point of view of technological and economic efficiency, some political institutions appear increasingly dysfunctional.

In the American case, a nuclear disaster would in many respects appear to speed up these patterns of change. Vested interests would be undermined and some of the inhibitions imposed by legalism and tradition would be loosened.

Rescue and early recovery activities upon emerging from shelters would have to ignore traditional political boundaries. For months, perhaps several years, politics and party competition would perforce have to take second place to administration. Initially upon emergence, the skilled activist--the trained rescue worker, the technician, the engineer--would bear the brunt of the rescue and recovery activities. The manifest need for coordination and efficient direction of the recovery effort, however, would soon put a premium on the administrative expediter and generalist with his professional staff. The successful administrator would have to have political talents to obtain agreement on the means of recovery and to mobilize massive popular support for the reconstruction effort. Nevertheless, the "luxury" of democratic politics would probably have to be foregone for some time. As a concomitant, the administrative direction of the recovery would also eclipse legislative bodies.[99]

(footnote 98 continued) grass-roots democracy--which includes "direct exposure of the governmental system to the veto of the voters"--acts to maintain the status quo in governmental boundaries and structures.

[99] Legislative bodies--the Congress, state legislatures, city councils, etc.--might be (and should be) rather quickly convened to provide continuity of political authority and to legitimize the recovery efforts. In the short term, however, their functions would likely be more symbolic than substantive. During World War II, for example, both Parliament in Great Britain and Congress in the United States continued to hold sessions. (In the U. S. even Congressional and Presidential elections were held.) However, in both countries, the legislative body played a decidedly subordinate role; Prime Minister Churchill and President Roosevelt completely dominated the governments and directed the war effort.

Some of these initial reactions would later be modified; but they would leave their impact. As reconstruction proceeded, it would be reasonable to expect pressure for new and larger political boundaries, more consonant with demographic patterns and economic activities. Increasing uniformity in local governmental structures would be encouraged. Political parties and political competition would gradually revive after a hiatus on politics, and efforts would be made to re-establish old or to fashion new popular controls over the professional administrator; but one might expect more professional management of public affairs than was the case before the attack.[100] Finally, the pluralism, individualism and tradition of limited government might be expected to effect a gradual de-politicization of society. Reduction of governmental powers would also result from the increasing ability of institutions, such as churches, schools and families to manage their own affairs.[101]

Although asserting that, at least in the short run, there would likely be an increase in governmental powers, I have thus far begged the questions: (1) at what level these powers would be exercised--federal, state, local, or yet some new political subdivision--and (2) whether, in the long run, the government--and especially the federal government--would suffer an increase or diminution of its powers. One can assert with some certainty that a number of the existing complex relationships among various governmental units would be disrupted and would have to be simplified to promote more decisive rescue and recovery operations. However, the variables are so complex that the answers to the two basic questions posed can only be approached with timidity.

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[100] Even though the exigencies of the situation would probably vitiate the real operations of democratic processes for a time, one might expect the motions to be observed and repeated pledges made to return to normal practices as soon as possible. Such verbal maintenance of traditional practices and values would support eventual reestablishment of the substance, although form might be altered.

[101] Smelser argues persuasively that a great deal of the political conflict in the years and decades after the initial recovery effort will revolve around the rate and nature of de-politicization of society. Pervasive governmental direction of society in the initial post-emergence period would conflict with the American tradition of a relatively low level of governmental interference in society and with much of the American political culture. See Smelser, Ch. II above, pp. 246-247 and 259-260.

In part, the answers rest on pre-attack civil defense arrangements; and secondly, the capacity of the various levels of government to handle the immediate crisis. Yet another complicating factor is the possibility that in many areas the military might have to step in to establish order. In short, the role of the federal government, in both the short and the long run, would rest on the effective capabilities demonstrated by governmental authorities at all levels and by the military at various stages of the recovery.

Evidence can be cited on both sides of the question of the need for governmental action after nuclear war. Hirshleifer arrays considerable historical evidence on the side of his argument that extensive governmental controls hamper economic recovery: war communism and the N. E. P. in Russia, the American Civil War, and the Japanese and German recoveries from World War II.[102] However, historical analogies can also be marshalled on the side of extending governmental direction of the economy: the wartime mobilization in the U. S. and Great Britain, the great American depression in the 1930's and, most significantly, the rapid recovery of the Soviet economy after World War II under the mechanism of a a command economy. It can be argued that in a nuclear war the federal government might lose popular support since it could be at least partially blamed for blundering into the disaster, and, moreover, that much of the apparatus and records of the federal government would be destroyed.[103] On the other hand, the federal government has taken more precautions than most local and state governments to ensure the survival of records and key personnel and has more carefully developed emergency plans. Although still not necessarily thoroughly protected, the federal government would be in the best position to allocate scarce resources and to direct most efficiently and effectively the recovery effort. Evidence gleaned from disaster studies does not suggest that during and immediately after a crisis

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[102] Hirshleifer, op. cit.

[103] See, for instance, Kenneth E. Boulding, "A Pure Theory of Death: Dilemmas of Defense Policy in a World of Conditional Viability," in George W. Baker and Leonard S. Cottrell, Jr. (eds.), Behavioral Science and Civil Defense (Washington, D. C.: National Academy of Sciences--National Research Council, 1962), pp. 53-72.

the mass of the population is in any condition or has any inclination for rebellion against authority.[104] On the contrary, the bulk of the population might be expected to look to established and recognized leadership for guidance and support. Popular views of the government's legitimacy previous to the attack and the governmental efficacy in handling the crisis itself will affect the people's reactions to authority. But even under fairly negative conditions in these two respects people would probably continue not only to obey, but also to look to government for leadership.[105]

As should be expected, speculation about such developments several steps removed from the actual disaster are likely to be as prescriptive as they are descriptive and analytical. Those who believe that federal regulations and controls have become so extensive as to threaten individual liberties or to hamper economic growth, will tend to expect (and hope for) a lesser federal participation in recovery.[106] The opposite is true for those who favor increasing federal participation in the life of the country for one reason or another: because of the alleged greater efficiency and expertise of the federal administration compared to local governments; because the federal government can be more effective due to its larger resource base; because the federal government expresses a national

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[104] See Fred Iklé, op. cit., Ch. 1.

[105] Smelser argues that "the overriding need for post-attack society [is] ...for central coordination of rescue and relief of persons, repair of damage, and control of disruptive behavior." His discussion provides a concise summary of the argument that the post-attack society will require extensive federal governmental direction. He rests his case on the need for central coordination of various organizations to conduct an effective recovery effort and to prevent debilitating conflicts, competition and confusion; and the inability of local governments to cope with the overload of problems from a nuclear attack. He cites Barton's conclusion after reviewing the disaster literature to the effect that, "very large scale disasters require major national programs; local efforts are overwhelmed and become ineffective." Smelser, Ch. II above, pp.

[106] Hirshleifer's argument appears to me quite value-laden, if only by his selection of historical cases. Boulding quite explicitly states that he is being prescriptive. Both argue that, to use Boulding's phrase, "the price-profit system has extraordinary powers of regeneration and recuperation." Boulding, loc. cit., p. 67.

as against a regional point of view; or perhaps because they believe that local governments are less democratic and representative and less supportive of individual freedoms than the federal government, especially in the area of civil rights and liberties.

The prescriptive content of these speculations is recognition, sometimes unconscious, of the fact that the actions of political man are not necessarily predetermined and that he will have some control over his destiny.[107] To reinforce the point made above, the preparations made before an attack and the immediate response to the attack will have a considerable impact on the long-range implications for the role of the federal and local governments.

The Soviet Case. In the Soviet case, it is more difficult to discern with clarity the trends of change for they are more recent. We have already noted the greater use of persuasion and mobilized popular participation in the place of force and terror, and the limited relaxation of overt controls on criticism. In the economic realm during the last ten years there have been increasing signs of dissatisfaction with the highly centralized command economy.[108] Steps were taken in the 1950's to remove some of the more rigid administrative and legal controls over industrial labor imposed in 1940 and to rely more heavily--although far from completely--on market forces and incentives to regulate the allocation of labor. A number of administrative experiments were attempted to improve industrial management in the late 1950's and early 1960's but they were largely palliatives which did not prove lasting. Finally, during the last four years there has been a surprisingly far-ranging public discussion of various schemes to build greater flexibility and initiative into the management of the economy; some pilot projects have been instituted which could point (although not inevitably) in the direction of some eventual form of market socialism, in the style of Yugoslavia or Czechoslovakia.

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[107] Cf. pp. 7-9.

[108] For a concise and perceptive summary of the nature of the "command economy" see, Gregory Grossman, "The Structure and Organization of the Soviet Economy," Slavic Review, XXI, 2 (June, 1962), pp. 203-223.

The issues are too involved to be discussed here.[109] However, the difficulties with the present command economy revolve around the problems of centrally planning in detail an increasingly complex and sophisticated economy which is also giving greater attention to the consumer sector.

In agriculture, also, there is some prospect of change. The well-advertised Soviet agricultural disappointments since 1958 typically led to some frantic organizational improvisation by Khrushchev, but without notable success.[110] Indeed, after his ouster, he was obliquely accused of damaging agriculture by giving vent to his "organizational itch." Lagging agricultural production has resulted from a number of factors, including a relatively unfavorable natural environment, and the favoring of industry at the expense of agricultural development. The collective-state farm system, however, with its built-in rigidities and lack of peasant incentives, has certainly contributed to the dismal showing of this sector of the economy--as recognized by the greater scope given to private initiative on the collective farms soon after Khrushchev's ouster in October, 1964.

With some exaggeration, these incipient trends in the Soviet economy can be capsulized as beginning a process of loosening the bonds of the command economy run primarily by administrative fiat backed up with a whiff of grapeshot. If continued they would seem to imply a decreasing direct political guidance of the economy and greater reliance on indirect control by manipulating supply and demand. As a corollary, one would also expect to see the evolution of greater institutional differentiation--not necessarily only in the economy. Even the party is subject to the trend toward increasing specialization.

Would a thermonuclear disaster reverse or retard these trends or would they be accelerated? The evidence is mixed. With the disruption of the central planning system, enterprises would be thrown to a large extent on their own resources, and managers would willy nilly find themselves possessed of greater

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[109] See Alec Nove, "The Liberman Proposals," Survey, No. 47 (April, 1963), and Howard R. Swearer, "Khrushchev's Administrative Reforms," Challenge, II, 1 (April, 1963), pp. 18-20.

[110] Swearer, "Agricultural Administration Under Khrushchev," in Roy Laird, op. cit.

autonomy of operation. In agriculture, difficulty in controlling spontaneous peasant efforts to enlarge their private plots or either covert or overt government encouragement of private initiative as a way to stimulate production would lead to looser bonds within collective farms. During World War II, in many areas the peasants, with the tacit approval of the local officials, did enlarge their private plots and the proportion of private production increased. Moreover, rumors were afloat, perhaps started by the regime, that after the war the collectives would be broken up.

These short-run reactions would buttress the trends visible in the economy as outlined above. Moreover, as in the United States, the disaster, by breaking the cake of custom, could encourage greater innovation. In view of the fact that the regime had faced increasing difficulties with the centralized command economy before the attack, might it not resolve to encourage lines of recovery that would avoid a similar situation sometime in the future when the economy had been restored?

Nevertheless, I find more persuasive the evidence also derived from World War II experiences in support of the proposition that nuclear disaster would ultimately result in a tightening of the command economy and a reinforcement of political control over all institutions.[111] The burdens of the attack would most likely re-emphasize political direction of society through the Party, nipping trends toward institutional autonomy. Inbred habits of mobilizing and allocating resources--both physical and human--through administrative fiat would strongly assert themselves. It should be noted, in this connection, that cutting off the normal administrative and planning connections between industrial enterprises and higher authorities, which will force managers to operate more autonomously, does not, by the same token, necessarily mean that local or regional industrial economies will be freed from administrative controls and will begin spontaneously to operate under a profit-price system. More probable, under the exigencies of the situation, the primary role of the Party and the ingrained habits of the command economy,

[111] See pp. 475-482 and pp. 502-503, above.

the local Party apparatus will intervene directly and massively in allocation of resources, the movement of labor, etc. Although a return to terrorism might not be required, the local authorities would probably treat harshly any deviational behavior which it considered dangerous, and the litmus test of political orthodoxy would be made more sensitive.

Despite the strong possibilities of loosening the collective farm system, the institution itself is not likely to be abandoned; after recovery was underway, a retightening of collective controls might be expected. This is what happened after World War II when a currency reform wiped out the wartime savings of the peasants and collective farm lands were reclaimed from the private plots. The collective farms over the long haul may not have proven themselves very effective in stimulating the growth of agricultural production; but, they provide a convenient format for enabling the regime to extract food from the countryside cheaply to feed the cities and support industrial production. For this very reason the Germans kept the collective farms in their occupational zones.

As noted earlier, in the immediate post-attack period, under the local Party apparatus, fragmented local authority could be welded together rapidly and local governmental units would perforce have to operate with considerable autonomy. If permitted to persist over a long period of time, habits of local autonomy might develop that would threaten the power of the national elite. "Localism" became a problem in 1957-62; it would be even more serious in the eyes of the national leadership under the circumstances prevailing after a nuclear attack. Localism would assume an even more dangerous complexion if it became larded with nationalistic sentiments in the non-Russian parts of the Soviet Union. For this very reason the leadership would likely move as rapidly as physically possible to re-assert its controls at the local level. It is difficult to see how local officials would resist the re-imposition of central controls even if they so desired. On its part, the leadership would probably not hesitate to use force if necessary. In the political realm local party cadres would be disciplined and shifted from one locality to another when enough time had elapsed to make this possible. Various propaganda-agitation campaigns for partiinost (party-mindedness) and other nationally-oriented values would be launched. As the links in the planning-industrial

administration system were restored, Gosplan and central industrial-branch committees and ministries would assume the job of directing the national economic recovery. Gradually, one might expect a re-imposition of the old system of overlapping and fragmented authority at lower levels and some contraction of direct involvement by lower Party functionaries in daily administration.

To summarize the argument and make the time sequences explicit, in the initial post-emergence phase tendencies in institutional developments would be mixed. Greater reliance on private initiative in the collective-state farms and in trading might be encouraged to promote economic recovery. Local industrial enterprises would be thrown back on their own resources and forced to improvise. On the other hand, visible and recognized local authorities--primarily from the party apparatus--would be expected rather quickly to exert their control over local activities. While local political authorities might even encourage for a period these "spontaneous" efforts in recovery, this flexibility probably would not countenance dismantling the pre-attack institutional structures themselves nor result in major ideological modifications. Moreover, pressures for permitting greater private initiative and organizational autonomy in recovery would be countered by the tendency of local authorities to rely on the well-worn political-administrative and mass-organizational techniques to control the population. Conservatism, expressed in maintenance of established institutions, ideological orthodoxy and re-assertion of massive political direction of society, would also be encouraged by the national leadership. In addition, as soon as it could physically exert its will, the national leadership could be expected to discipline local authorities in order to control any manifestations of local autonomy and to enforce a "national" recovery effort.

These predictions, of course, follow rather closely the events following World War II in the Soviet Union. Certainly a post-nuclear disaster recovery would not replicate the 1945-50 period; but the situations appear to be sufficiently alike to suggest that the general configurations would be similar. The re-imposition of central controls and the tightening of the command economy after World War II was rapid and often vicious. While other factors--especially personal rivalries among the political elite and Stalin's obsession to nip in the bud any

potential resistance to his will--were also at work, the post-war purges in the localities, especially in Leningrad, were probably related to this drive to crush any local autonomy from central controls.

The Need for Institutional Responses to Stress

By way of summary, let us revert to the use of the concepts of the "market" and "organizational" societies employed in the discussion of modernization and recovery. We have described the United States as a market society and the Soviet Union as an organizational society; yet, within each society elements of the other type exist and appear to be increasing in importance. Broadly, the impact of a generalized nuclear disaster in the United States would appear likely to promote the further growth of organizational characteristics (although not necessarily to the degree of pushing it from the market to the organizational category). In the Soviet Union a nuclear disaster would likely retard or reverse the growth of market elements and result in the re-affirmation of the organizational society.

If nothing else, it is hoped that this paper has highlighted the fact that post-attack recovery depends on far more than merely the survival of personnel and resources. How a society prepares for nuclear disaster, withstands the shock of the attack and handles the long-range recovery will depend in considerable degree on the nature of its institutions, particularly its political institutions. Moreover, these institutions themselves are vulnerable in varying degrees. Consequently, if they are valued, their defense must also be shored, a job that is complicated by the fact that the creation of such defenses may itself require some difficult institutional modification. One point is clear: it would be a grave mistake to indulge in wishful thinking along the lines that even if there were massive physical destruction, a society would muddle through with its institutional structure unscathed. As Karl Deutsch has recently observed: "Almost every culture or political system assumes tacitly that its values are compatible with its continued survival, but history records that in the past such assumptions proved sometimes mistaken."[112]

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[112] Karl Deutsch, Nerves of Government (Glencoe, Ill.: The Free Press, 1963), p. 60.

Introduction to Chapter VI

In this chapter on "Methodological Issues in the Social Analysis of Nuclear Attack and Recovery", Neil J. Smelser returns to the domains of social dimensions and social phenomena which he considered in Chapter II. Now, however, his primary concern is with the methodological status of propositions about post-attack behavior and society. In particular, he is concerned with the scientific status of these findings. Smelser sees inferences about the social and psychological aspects of nuclear attack and recovery as deriving from four orders of knowledge: knowledge about the potential physical effects of nuclear weapons; knowledge consisting of empirical data about attack targets (including demographic and geographic knowledge); knowledge about the effects of other phenomena which are, in certain respects, similar to nuclear attack and its aftermath; and knowledge which consists of a complex store of theory and empirical propositions on the general traits and interrelations which characterize social and psychological phenomena. The central question of Chapter VI is, then, "What scientific canons should be observed in combining these four orders of knowledge if we are to generate the most nearly adequate predictions about the social and psychological consequences of nuclear attack?" Smelser proposes to begin his discussion in a review of the characteristics of scientific inquiry and, by stages, to move into an analysis of the kinds of systems of predictions which can be made about post-attack social phenomena. He will conclude with an examination of the limitations upon present attempts to construct a scientifically valid model of post-attack societal recovery.

Scientific inquiry begins in specifying a problem, which occurs when analysts identify "some observable range of empirical variation and [ask] under what conditions this particular kind of variation occurs. The range of variation in question (often referred to as the dependent variable, or outcome) constitutes what is to be explained. The conditions (often referred to as the independent variables, factors, determinants, or causes) constitute that which is used to do the explaining". The basic task of scientific analysis is to organize these variables into simplified sequences which exhibit patterns of association. The distinction between "independent" and "dependent" variables is a relative one; sometimes, it is more useful to

distinguish conditions which are treated analytically as parameters from conditions which are treated as operative variables. "Parameters are conditions that are known or suspected to influence the dependent variable, but which, in the investigation at hand, are made or assumed not to vary. Operative variables are conditions that are known or suspected to influence the dependent variable and which, in the investigation, are made or allowed to vary in order to assess this influence".

On the basis of his preliminary distinctions, Smelser distinguishes explanation from prediction and prophecy. "Scientific prediction, ..., is a statement of the conditions under which an event may be expected to occur; prophecy is a statement that an event will occur".

Depending on the kinds of data which are available and the kinds of analytic manipulation to which the scientist can subject his analytic problem in a particular situation, the scientist may choose one of several methods of scientific inquiry. These methods utilize characteristic ways of transforming conditions into parameters and operative variables. The principal available methods are the experimental method, the statistical method, the comparative method (which, "like the statistical method, is an imperfect substitute for experimentation"), the method of heuristic assumption, and the case study method (of two types: deviant case analysis and isolated clinical case analysis). Smelser finds that the special requirements of making inferences about effects of nuclear attack require use of the comparative method. "The social units being compared in this particular case are, first, the hypothetical post-attack society, and second, known historical situations that resemble post-attack society in certain respects. Since this operation involves comparing social phenomena in very diverse socio-cultural settings, it raises all the problems of comparability that plague the method of comparative analysis in general". Among these problems are three of special importance:

> -"How can we be certain that the events and situations we wish to explain --- the dependent variables --- are comparable from one socio-cultural context to another?"
>
> -"How can we be certain that the dimensions used to compare societies cross-culturally do not distort the events and situations being compared?"

-"How is it possible to compare very different social units (or social systems) with one another?"

Smelser argues that "The amount of difficulty generated by these three questions rests entirely on how adequately the investigator chooses and operationalizes his comparative dimensions".

In beginning his specific discussion of the post-attack situation, Smelser lists kinds of dependent variables --- "the phenomena we wish to explain" --- according to whether they are short-term or long-term consequences of attack. "Among the short-term consequences are various psychological effects (including bereavement and all its complications, depression, anxiety, hostility, psychosomatic disorders, and so on); trial-and-error, dazed, or immobile behavior; rumor; panic; heroic rescue and relief behavior; hostile outburst and scapegoating; criminal and other deviant behavior (black-marketeering, looting, murder, cannibalism); conflict among social groups; religious behavior, including the rise of cults; political behavior, including revolutionary challenges against the surviving government. Among the long-term consequences are the relative rates of recovery of social resources, population, productive capacity, and institutional life in the months and years after attack". Smelser then restates the independent and intervening variables which he outlined in Chapter II, in preparation for arranging them into patterns of parameters and operative conditions which affect these dependent variables.

Smelser points out that "predictive propositions about post-attack society also rest on the distinction between parameters and operative conditions. To generate these propositions it is necessary to make certain parametric assumptions about certain of the variables --- i.e., to 'immobilize' these variables by making them parameters --- then to investigate the effects of other variables that operate within this framework of assumptions". Smelser notes that Sidney Winter (see Chapter IV, above) has concentrated on technological variables in his model of viability: for analytic purposes at hand, Winter has converted a number of potentially operative variables into parameters. Speaking more generally, Smelser points to "two especially delicate problems with respect to the relations between parameters and operative variables":

-"many parametric assumptions about the dimensions of attack and the disposition of society at the time of attack must be continuously revised in the light of the changing technology of nuclear warfare and defenses against it".

-"One of the peculiar --- and alarming --- features of modern nuclear war is that in certain instances one variable may 'overwhelm' all others that otherwise might be operative in post-attack society".

There are a number of particular problems which arise when the analyst attempts to apply data from other situations to the case presented by nuclear war and post-attack society. The investigator must cope with many restrictions on his ability to isolate and control operative variables. Furthermore, he is "restricted in the degree to which variables can be quantified effectively". Finally, in using the comparative method for bringing data from other situations to bear on the study of nuclear attack effects, the investigator inherits the difficulties of the comparative method in controlling time and in generating causal inferences by examining "before-and-after relations".

After this extensive analysis of the key scientific issues, Smelser turns in Part III of Chapter VI to a study of types of comparative analysis in the study of nuclear attack and recovery. He constructs a typology based on three dimensions: types of dependent variables that enter the analysis; the number of social units involved in the comparison; and the static or dynamic quality of the comparison. He differentiates the principal <u>levels</u> of dependent variables in social analysis as:

-"Variations in aggregated attributes of the population of a social unit".

-"Variations in rates of behavioral precipitates in a population over time".

-"Variations in patterned social interaction (social structure)".

-"Variations in cultural patterns".

These variables stand in an analytic hierarchy. As the analyst moves upward in the hierarchy, from relatively specific aggregated attributes to very general cultural patterns, variables that it had been convenient to treat as parametric now become operative, with precise requirements for analytic manipulation.

The reader will note that Smelser's discussion of this shift illuminates one of the most persistent confusions in the application of evidence from other situations to the study of post-attack social phenomena. So often, analysts will be struck by the "relevance" of such events as earthquakes, famines, and plagues to the study of possible post-attack social phenomena. So often, however, the analysis bogs because the analyst is unable to say precisely why and how these cases are relevant.[1] Failure to differentiate the levels at which operative variables must be compared in their effects is a prime reason for this failure. In Table VI-1, Smelser presents an application of his total typology, to illustrate the differences in kinds of data which are available and how they may be applied to the study of post-attack society. This Table may assist analysts in making a number of distinctions which have heretofore been so elusive in the social analysis of nuclear attack.

Smelser now proceeds to conduct a methodological review of the phases and variables which he employed in his earlier chapter. His special concern is to show how the comparative method illuminates methodological issues which were only partially stated in that Chapter, and how research might continue --- following new definitions of the salient problems. Smelser assesses the work of Mack and Baker on public reactions to false warnings, showing that it conforms to many of the criteria he has laid down for sound comparative analysis of the operation of variables. As an example in the refinement of emerging theory about the post-attack society, Smelser concludes his long review of substantive propositions with an assessment of the problem of "role conflict" and its potential consequences after nuclear attack. Finally, Smelser offers some comments on the problems in addressing the task of creating formal models of attack and recovery. Such a task is actually a special case in the larger issues of constructing models of the processes of social change, and at this point, Smelser comes to one of the principal frontiers in the social sciences today.

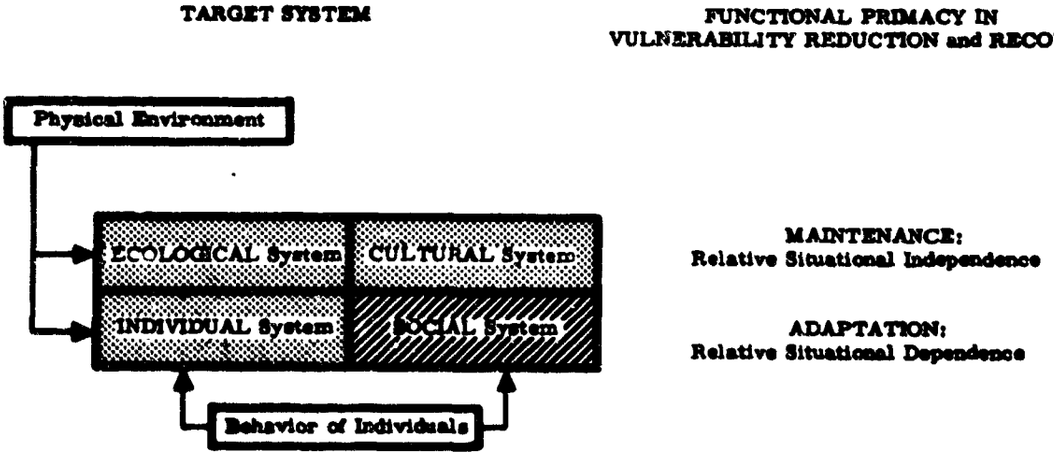
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[1] For a recent study which tries to overcome some of these problems of comparing cases from markedly different eras to present circumstances, see Jack Hirshleifer, Disaster and Recovery: The Black Death in Western Europe (Santa Monica, Calif.: The RAND Corporation, RM-4700-TAB, February, 1966).

Throughout his essay, Smelser seeks to draw on the mainstream of substantive data in the social sciences. Some readers may object that his approach is more suited to constructing limited empirical generalizations about collective behavior in the social system than it is to setting up broad, firmly based propositions and predictions about patterns of institutional evolution after attack. The reply would be, in part, that if conditional predictions of post-attack phenomena are to have substantive basis, they must begin in the wealth of information available about behavior in the immediate situation of action, and then work toward more comprehensive propositions and predictions. The meaning of Smelser's use of the comparative method as a framework for a methodological critique is, in fact, that it permits and encourages this process of "induction upward", but that it grounds this process of induction in orders of data which have clear analytic relations to the most relevant empirical realities.

Figure VIa-1

PRIMARY TOPICAL EMPHASES IN CHAPTER VI



Chapter VI

METHODOLOGICAL ISSUES IN THE SOCIAL ANALYSIS OF NUCLEAR ATTACK AND RECOVERY*

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I. Some Methods and Approaches from the Social Sciences

The objective of this working paper is to analyze some of the methodological issues that arise in connection with making scientific predictions about the social and psychological effects of a nuclear attack and the patterns of recovery from such an attack. The paper is both an essay on the methodology of social-scientific investigation, and an application of this methodology to a range of empirical situations that would likely arise if American society were to sustain a massive nuclear onslaught.[1]

At first glance, to build scientific knowledge about post-attack society--and to outline the methods of building it--seems impossible, simply because a nuclear war would be such an awful and novel thing. With respect to its awfulness, it is evident that many would prefer not to gain knowledge or even think about the effects of a nuclear war, but would prefer to deny that it could happen or to

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*Responsibility for all the ideas set forth in this working paper is solely mine. Several portions of the paper, however, especially those on the scientific method in general, were written for incorporation not only in this paper, but also in a separate manuscript--"The Methodology of Comparative Analysis" (in preparation)--co-authored with Seymour Martin Lipset. Though I drafted all the material that both papers share, I profited from discussions with Lipset, and would like to acknowledge my debt to him.

[1] The present paper is a methodological supplement to my earlier working paper--The Social Dimensions of Nuclear Attack (Chapter II of the present volume) in which I emphasized substantive predictions about probable consequences and ranges of recovery in post-attack society.

preoccupy themselves solely with possible ways of preventing it. Even if we are willing to think about the consequences of this possible war, we must contend with its novelty. A nuclear war of the magnitude now possible has never occurred; its effects, unlike the effects of past wars, are unknown, because they lie in a future we hope will never come to pass. Furthermore, because of the destructive potential of nuclear weapons, such a war would be in many respects qualitatively different from anything human civilization has ever known;[2] we therefore have no directly comparable situations from which to draw inferences about the social and psychological aspects of nuclear attack and recovery.

We do possess, however, four orders of knowledge which, if properly combined, can serve as a basis for drawing such inferences. First, we possess fairly reliable knowledge about the potential of nuclear weapons for physical and biological destruction.[3] Second, we possess empirical data about the targets of nuclear attack--the size of the populations of the countries of the world; the distribution of these populations between metropolitan and rural areas; the distribution

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[2]While it is important to underscore the incomparable and unfamiliar features of nuclear war, it is essential to avoid leaping to hysterical conclusions we may be tempted to embrace whenever we regard a frightening and unfamiliar situation. It is well to remember Titmuss' commentary on the British mentality before the outbreak of bombing in World War II: "A war of armies and navies was understood; discipline and behavior were under control, the individual took from the group a recognized and accepted standard of conduct, and behavior was within certain limits predictable. But how would civilians behave? They could not be put into uniform, neither given the same group loyalties nor controlled and led in the same way as an army. Military authorities, when considering the problems that might arise in a future war, were rarely led to contemplate the contingency of wholesale neurosis and panic in the armies under their control. But this was a possibility which was never far from the minds of the civil authorities when they considered the need for emergency services to provide for the social consequences of a war on civilians. It seems sometimes to have been accepted almost as a matter of course that widespread panic would ensue... it is difficult to find a hint that this fear of a collapse in morale was based on much else than instinctive opinion." Richard M. Titmuss, Problems of Social Policy (London: His Majesty's Stationery Office and Longmans, Green & Co., 1950), pp. 16-17.

[3]I do not mean to imply here that the knowledge of the physical and biological effects of nuclear weapons is perfect. Indeed, among the scientists who have attempted to analyze these effects, significant controversies have developed and remain unresolved to the present day--controversies over subjects such as

of skills in these populations; the distribution of strategic military points. In short, we know much about the size and shape of what is facing destruction. Third, we possess considerable empirical knowledge, however imperfect, about the social and psychological effects of other phenomena--famines, disasters, conventional bombings, for example--that resemble hypothetical nuclear attacks in some and differ from them in other respects. And fourth, we possess a store of theory and empirical research on the general relations among social and psychological phenomena. This last type of knowledge is of mixed quality. For instance, we know more about the relations among investment, income and prices under various economic conditions than we do about the relations between social disorganization and political protest. Despite its mixed quality, this store of general social-scientific knowledge provides a basis for understanding heretofore uninvestigated situations.

The central question of this paper, again, is: What scientific canons should be observed in combining these four orders of knowledge if we are to generate the most nearly adequate predictions about the social and psychological consequences of nuclear attack?

In confronting this question I shall develop an argument by several steps. First, I shall review the general character of scientific explanation and prediction, and present the various methods by which these are attained. These methods are the experimental method, the statistical method, the comparative method, the method of heuristic assumption, and the case study method. I shall outline the similarities and differences among these methods. In this initial stage of the argument, most of the empirical illustrations will not refer specifically to conditions in post-attack society.

(footnote 3 continued) the effects of terrain and climate conditions on fallout, the long-term genetic effects of exposure to radioactive fallout, the casualty effects of direct blast, and so on. Many of these controversies stem from inadequate scientific knowledge. Nevertheless, it is true that in comparison to the state of knowledge concerning the psychological and social effects of nuclear attack, knowledge in the physical and biological realms is relatively reliable.

Second, I shall examine the issues that arise when these methods of scientific inquiry are applied to the study of the social and psychological effects of nuclear attack. In this connection I shall give special consideration to the comparative method and the method of heuristic assumption, since these are the most appropriate methods for generating predictions about post-attack society.

Third, I shall outline the kinds of changes in post-attack society we wish to explain--changes in the composition of the population, changes in people's behavior, changes in social structure, and changes in cultural patterns. In scientific terms these constitute dependent variables. On the basis of these variables it will be possible to classify the several levels of comparative analysis to be used to bring social-scientific knowledge to bear on post-attack changes in behavior and institutional structure. After specifying these dependent variables, moreover, I shall be able to discuss the criteria for defining the concepts of "societal vulnerability" and "societal recovery," which are central in the analysis of post-attack society.

Fourth, I shall identify a number of independent and intervening variables from which propositions concerning changes in the dependent variables may be generated. Among these independent variables are the intensity and extensity of the nuclear attack, the disposition of the society at the time of the attack, and the ways in which the agencies of social control operate in post-attack society. I shall show how these variables operate in various non-attack situations and indicate how they would operate under conditions of nuclear attack. At the same time, I shall suggest respects in which non-attack situations are comparable with hypothetical nuclear attack situations and the respects in which they are not comparable.

Finally, I shall explore the possibilities of refining and combining independent and dependent variables into determinate systems of predictions (models and theories). I shall perform two analytic exercises: (a) I shall take a discrete set of empirical relations--between disaster and role-conflict on the one hand and between role-conflict and individual behavior on the other--and show what steps are necessary to incorporate these relations into a determinate theory of individual behavior in the face of a nuclear onslaught. (b) I shall spell out the criteria

necessary for creating a complete scientific model of post-attack societal recovery. Then, on the basis of these criteria, I shall show the limitations of any attempt to create such a model in the present state of knowledge in the social sciences. In this connection I shall set forth some observations on various efforts to create models of post-disaster recovery.

In developing the analysis in the remainder of the paper, I hope that whatever results I produce may prove valuable in two ways--first to serve as a set of methodological criteria for assessing existing research, and second to serve as guidelines for future research on post-attack society.

Methods of Scientific Explanation and Prediction

The Character of Scientific Inquiry. Scientific inquiry rests in the first instance on the specification of a scientific problem. We specify a problem by identifying some observable range of empirical variation and asking under what conditions this particular kind of variation occurs. The range of variation in question (often referred to as the dependent variable, or outcome) constitutes what is to be explained. The conditions (often referred to as the independent variables, factors, determinants, or causes) constitute that which is used to do the explaining.

The dependent variable may be represented as an empirical universal, displaying no variation: as, for example, in the scientific question, why do all societies everywhere prohibit marriage between fathers and daughters?[4] Or alternatively, the dependent variable may be represented as a range of different values: as, for example, in the scientific question, why do voters at different

[4] For a statement of this universal and an attempt to investigate some of the social and psychological conditions underlying it, cf. George P. Murdock, Social Structure (New York: Macmillan, 1949), p. 12 and Ch. 10; also Talcott Parsons, "The Incest Taboo in Relation to Social Structure and the Socialization of the Child," British Journal of Sociology, V, (2) (1954), pp. 101-117. For one of the several challenges to the "universality" of this phenomenon, cf. Russell Middleton, "Brother-Sister and Father-Daughter Marriage in Ancient Egypt," American Sociological Review, XXVII, 5 (October, 1962), pp. 603-611.

income levels turn out to vote in different proportions?[5] In one respect it does not matter whether the dependent variable is represented as a universal or as varying empirically; in both cases a regularity in the range of variation is identified; in the former case this range happens to be zero.

For any given dependent variable, the number and kinds of conditions that may affect its variation are, at first sight, discouragingly great. An individual's ability to perform a simple task in a small-group setting, for example, is influenced most immediately by his intelligence, training, and motivation. These three factors are further conditioned by his social-class background, his ordinal position in his family, the presence or absence of others in the same room when he is performing the task, the behavior of the person assigning him the task, and a hundred other factors. When we turn to the search for conditions influencing the movement of complex social aggregates, such as changes in the divorce rate over the past century, the number of potentially operative conditions is even more formidable. The initial picture, then, is one of a multiplicity of operating conditions, a confounding of their influences on the dependent variable, and an indeterminacy regarding the effect of any one condition or several conditions in combination. The corresponding problems facing the scientific investigator are to reduce the number of operating conditions, to isolate one condition from another, and thereby to make precise the role of each condition, both singly and in combination with other conditions. How does the scientific investigator face these problems?

The answer to the question is that he imposes some sort of organization on the conditions. One of the simplest ways of organizing conditions is seen in the distinction between independent and intervening variables. An example will show the simplifying power of this distinction. On the basis of a fairly systematic coverage of the cross-cultural literature, Whiting and Child found quite strong correlations between types of child-training practices and types of beliefs concerning the genesis

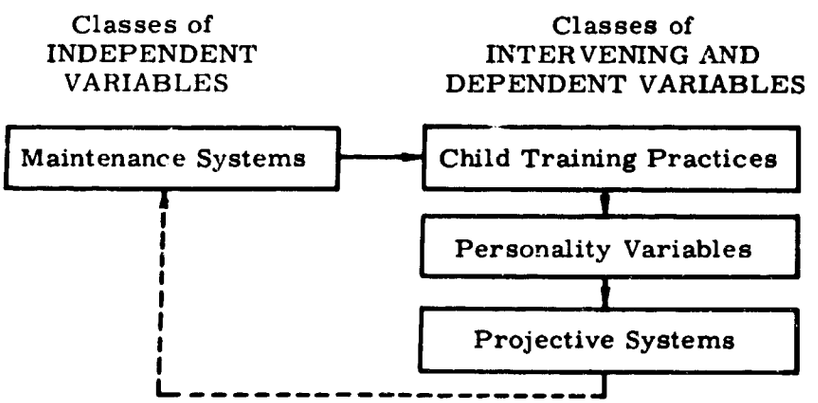
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[5] For a summary and evaluation of conditions relating to differential voting behavior, cf. Seymour M. Lipset, Paul F. Lazarsfeld, Allen H. Barton, and Juan Linz, "The Psychology of Voting: An Analysis of Political Behavior," in Gardner Lindzey (ed.), Handbook of Social Psychology Vol. II, Ch. 30 (Cambridge, Mass.: Addison-Wesley, 1954), pp. 1124-1175.

of disease; for example, cultures that impose strict and early weaning on their children tend in their belief-systems, to attribute diseases to "oral" causes such as poisoning.[6] In interpreting this association, Whiting and Child asserted first that certain personality variables--such as fixations on traumatic childhood experiences, and typical defenses against the anxiety associated with these fixations--"intervene" between child training and adult beliefs. That is to say, the personality variables are dependent in relation to child-training practices, but independent in relation to adult beliefs. Speculating further, Whiting and Child maintained that child-training practices are themselves dependent on a society's "maintenance systems"--"the economic, political, and social organizations of a society... surrounding the nourishment, sheltering, and protection of its members."[7] The several classes of variables thus constitute a chain of independent, intervening, and dependent variables, as shown in Figure VI-1.

Figure VI-1

REPRESENTATIVE CHAIN OF DEPENDENCIES AMONG CLASSES OF VARIABLES



[6] John W. M. Whiting and Irving L. Child, Child Training and Personality: a Cross-Cultural Study (New Haven: Yale University Press, 1953).

[7] Ibid., p. 310.

The picture of the variables, thus organized, is much simpler than the picture of the lengthy list of associations among each pair of variables.[8]

The example also reveals that the distinction among independent, intervening, and dependent variables is a relative one, and that the status of a given variable may change according to the analytic purpose at hand. For example, the variable, "child-training practices," is dependent with respect to "maintenance systems"; it is independent with respect to "personality variables"; and it is intervening with respect to the relation between "maintenance systems" and "personality variables." Furthermore, while the variable, "projective systems," is in every respect dependent in the example above, these beliefs may themselves turn out to be important independent variables if we inquire into the determinants of the "maintenance systems" themselves. In scientific investigation, then, a single substantive variable cannot be considered as inherently independent, intervening, or dependent.

Another important way of organizing conditions in scientific investigation is found in the distinction between conditions treated as parameters and conditions treated as operative variables. Parameters are conditions that are known or suspected to influence the dependent variable, but which, in the investigation at hand, are made or assumed not to vary. Operative variables are conditions that are known or suspected to influence the dependent variable and which, in the investigation, are made or allowed to vary in order to assess this influence. By making variables into parameters for purposes of analysis, most of the potentially operative conditions are made not to vary, so that one or a few conditions may be isolated and examined. As we shall see presently, each of the several methods of scientific inquiry rests on the systematic manipulation of parameters and variables.

Like the independent-intervening-dependent distinction, the distinction between parameters and variables is a relative one. What is treated as parameter in one investigation may be treated as a variable condition in another. Suppose,

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[8] To construct such implied causal sequences on the basis of simple associations alone, however, is fraught with methodological dangers, as we shall see below.

for example, it is known that foreign trade is a determinant of the national income of a society, but that calculation of the impact of foreign trade on the domestic economy is impossible unless certain internal relations--say, between private investment, government investment, and consumption--are already known. The investigator may proceed by assuming that foreign trade is a parameter--i.e., that it does not exist, or that it is constant throughout the time period in question--and, by thus simplifying the picture of the determinants of income, may proceed to establish national income as some function of private investment, government investment, and current consumption. Having established these relations, he may then "relax" the restrictive assumption about foreign trade, and "allow" it to vary, thus tracing its impact on the known relations internal to the economy. In this last operation the investigator has transformed the parameter into a variable. In the same operation he may very well have chosen also to transform domestic investment into a parameter--i.e., assumed it not to vary--in order to pin-point the impact of foreign trade more precisely.

By this continuous and systematic transformation of conditions into parameters and variables scientific explanation is refined and generalized. And when the investigator is able to assess the influence of the various conditions, in both their individual and combined forms, and express the causal relations among these conditions in some logical form--such as a series of equations--a systematic scientific theory is at hand.

For purposes of exposition I have developed the notion of a scientific theory "inductively"--beginning with an empirical problem (or set of problems), then showing how propositions relating to this problem are formulated and tested scientifically, and finally indicating how these propositions are combined into a coherent theoretical structure. It would have been equally permissible to characterize scientific inquiry "deductively"--beginning with a relatively formal definition of theory (for example, "a logically consistent set of relations among variables, from which is derived testable empirical propositions"), then proceeding to examine the logical canons by which propositions are derived from these relations, and finally examining the methods by which these propositions are tested empirically. Whether one characterizes scientific theory by beginning with empirical problems or with

theoretical systems is, to my mind, a matter of indifference, since either option invariably raises the identical set of scientific issues: How are propositions verified or rejected? How are propositions derived? How are scientific models created? How do we modify scientific theories in the light of empirical findings? And so on. For these reasons I believe it is an error to view "induction" and "deduction" as competing methods of arriving at scientific truths. Both the operation of moving from facts to theoretical systems and the operation of moving from theoretical systems to facts are integral parts of the scientific enterprise. Both proceed in complicated interplay as scientific knowledge develops.

Explanation, Prediction, and Prophecy. Before examining the several methods of scientific inquiry, I would like to distinguish briefly between explanation and prediction on the one hand, and between prediction and prophecy on the other. Both distinctions are important for the analysis of post-attack society.

Scientific explanation is--in the methodological language I have been using--a theoretically derived and logically exhaustive statement of the conditions (parameters and operative variables) by virtue of which a dependent variable displays a specific outcome (or range of outcomes) rather than some other outcome. An illustrative explanatory question is: "Under what conditions does an economy experience inflation rather than deflation?" Or even more precisely: "Under what conditions does it display only so much inflation, neither more nor less?"

Scientific explanation can be formulated at two levels--analytic and empirical. At the analytic level the explanatory question is posed in the context of a hypothetical model--for example, "Under what conditions does an economy experience an inflationary rise of ten per cent?" The answer is derived from the logical relations among the determinants of the price level as stated in the model. Absolute explanatory precision can be attained at the analytic level, since the investigator is dealing exclusively with logical relations among variables. At the empirical level the explanatory question is posed with respect to some concrete historical event or events--for example, "What were the conditions that led to a two-fold increase in prices between 1937 and 1957?" The answer is found by examining the historical conditions influencing the price level in this time period.

Explanations are far less precise at the empirical level than at the analytic level, since all the variables that operate historically are not so readily controllable as they are at the analytic level. In fact, absolute explanatory precision is possible at the empirical level only in the case of the perfectly controlled experiment, in which the investigator is able to control completely all the operating situational (historical) variables; but as we shall see, this perfect experiment is in principle unattainable.[9] Explanatory precision at the empirical level is, therefore, always a matter of degree.

The distinction between scientific explanation and prediction can also be viewed at the analytic and the empirical levels. At the analytic level there is no difference between the two, since explanations in the context of an abstract model are neither past nor future; they refer to hypothetical ranges of data. At the empirical level there is only one difference between explanation and prediction: whether or not the empirical phenomenon in question has occurred. Otherwise the two are identical; the scientific account of a past event (e.g., accounting for the outcome of a past experiment) involves the same operations as does the scientific prediction of a future event (e.g., hypothesizing the outcome of a future experiment). Both involve a derived, exhaustive statement of the conditions for the occurrence of the event.[10]

Now let us turn to the distinction between scientific prediction and prophecy.[11] Both concern future, unknown events. The major difference between

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[9] Below, pp. 552-553.

[10] It is sometimes maintained that predicting future, unknown events is a more rigorous test of a scientific proposition than explaining past, known events. In one sense this is correct. In the latter the scientific investigator can more readily "stretch" his theory by introducing ad hoc, non-derived explanations on the basis of already-known outcomes. This observation refers, however, to the relative opportunity for investigators to fail to live up to scientific norms, not to the logic of scientific explanation and prediction as such.

[11] I use the term "prophecy" to refer to an unconditional prediction about future event or state of affairs. This usage is not to be confused with the widely-known concept, "self-fulfilling prophecy," which refers to the fact that when persons hold a social belief (e.g., a belief about the personal characteristics of a

the two is that scientific prediction rests on carefully specified conditions, whereas prophecy is unconditional.[12] For example, it is a scientific prediction to forecast that the United States will experience a ten per cent rise in prices over the next two years if government spending continues to increase at its present rate, if no tax increases are voted, if the usual wage increases are granted by the steel and automobile industries, and so on. It is a prophecy to forecast, without reference to conditions, that the United States will experience a ten per cent rise in price over the next two years. Or again, it is a scientific prediction to forecast that the American economy will recover its productive capacity within fifty years after a nuclear attack if half of its productive capacity is destroyed, if forty per cent of its population is killed, if its constitutional form of government is not overthrown, and so on. It is a prophecy to forecast that the American economy will recover its productive capacity within fifty years after a nuclear attack. Scientific prediction, then, is a statement of the conditions under which an event may be expected to occur; prophecy is a statement that an event will occur.

Stated another way, the difference between scientific prediction and prophecy is that the former rests on a complex set of relations among parameters and operative variables; the latter rests either on some notion of "immanent process" or a single causal variable that overwhelms all other conditions. Stated still another way, the difference is that scientific prediction rests on the notion that all relevant variables are not controllable in the future, so that absolute

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(footnote 11 continued) minority group), the fact that they hold it becomes an independent variable in the creation of the social characteristics ascribed by the belief. See Robert K. Merton, Social Theory and Social Structure (Revised and Enlarged Edition) (Glencoe, Ill.: The Free Press, 1957), Chapter XI.

[12] Prophecy is an example of what Kaplan calls "prediction without explanation." Abraham Kaplan, The Conduct of Inquiry (San Francisco: Chandler Press, 1964), p. 349. Another difference between prophecy and prediction is that the former usually implies the presence of a degree of wish-fulfillment and an affective charge, whereas the latter does not. Since my concern with differences is primarily methodological, I shall not explore the subtle contrasts in emotional tone as between prophecies and predictions.

certainty in forecasting empirical events is not possible; whereas prophecy, being unconditional, rests on the notion that extraneous variables are not relevant to the future outcome, so that absolute certainty is possible.[13]

Contemporary thinking about the occurrence and consequences of nuclear war abounds in prophecies, both optimistic and pessimistic.[14] While the horrors of nuclear warfare are such as to create widespread belief in such prophecies, they are oversimple and therefore disadvantageous when it comes to thinking carefully and objectively about the complex tangle of variables that influence the vulnerability and the probable patterns of recovery of American society in the event that it sustains a nuclear attack. In this essay, I shall assume that simple prophecies--statements that envision, for example, physical or moral destruction, or easy recovery--are scientifically inadequate; my discussion will be limited to the methodology of establishing conditional predictions on the basis of existing theory and research in the behavioral sciences.

Methods of Scientific Inquiry. Up to this point I have been considering the general character of scientific inquiry. All scientific knowledge, however, is not generated by the same methods of inquiry; different scientific problems--as well as differences in the availability of data--force the investigator to vary his methods from situation to situation.

The differences among the several methods of scientific inquiry can be understood in terms of the ways that conditions are transformed into parameters and operative variables, respectively. Consider the following five methods:

(1) The experimental method involves the direct manipulation of situations to create parameters and operative variables. In a simple experiment in the

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[13] In practice the line between scientific prediction and prophecy is not so fixed as my characterization suggests. Many statements that appear to be prophecies (unconditional predictions) are based on implicit, loosely organized assumptions about conditions. Such statements lie between outright prophecy and explicitly derived scientific prediction.

[14] Smelser, The Social Dimensions of Nuclear Attack, Chapter II above, pp. 213-215.

natural sciences, the investigator wishes to determine the effect of temperature on the boiling point of water. To assess this effect, he must be certain that a number of other conditions--for instance, purity of the water and atmospheric pressure--are treated as parameters, i. e., not allowed to vary. If he does not assure this, the precise relation between temperature and the changing state of water will be "contaminated" by variations in these other conditions; and the investigator will not be able to determine the precise effect of the temperature changes. If he does control for purity and atmospheric pressure, the investigator will discover the "principle" that water boils at 212° Fahrenheit. To illustrate the relativity of the distinction between parameters and operative conditions, it may be pointed out that the investigator might have decided to treat atmospheric pressure as the operative variable and heat and pressure and parameters. In this case he would discover that other principles link independent variables with the changing state of water. In every case the emergent principle (or law, or prediction) is not a simple empirical universal, but a highly conditional statement of regularity, involving a number of assumptions about parametric constants within which and only within which the regularity holds.

In the behavioral sciences use of the experimental method is limited mainly to social-psychological and small-group experimentation. Most often experiments are conducted by establishing two groups--the experimental and the control--that are identical with respect to many known or suspected sources of variation, such as age, sex, intelligence, educational level, socioeconomic background, and the like; these conditions shared by the two groups are treated as parameters. Then, with regard to the operative condition under investigation, the experimental group is stimulated, the control group not; this condition not shared by the two groups is thus treated as the operative variable.

The experimental method has three advantages over the other methods of scientific investigation to be reviewed presently. First, because the investigator is able to manipulate the situation itself,[15] he is better able to isolate precise,

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[15] As contrasted with his being able to manipulate only the data produced by the situation by conceptual means.

relatively uncontaminated relations between independent and dependent variables. Second, and for the same reason, he is able to measure these isolated variables and relations more effectively. Third, because he is able to establish unambiguously what comes "before" and what comes "after" in the experimental setting--i. e., because time can be situationally controlled--he is better able to ascertain which variables are genuinely causal. Even with carefully-conducted experimentation, however, the investigator can never be completely certain of his results, because he can never be aware that he has made every possibly operative condition but one into parameters.

Unfortunately, most of the data of the social sciences are historical; they are the precipitates from social life that ebbs and flows without benefit of the presence of control groups. Furthermore, even if the investigator actually wishes to establish experimental and control groups, ethical and practical considerations prevent him from doing so in many instances--in studying suicide and crime rates, for example. The social scientist is therefore presented with given data; he is obliged to ask why these data are arrayed in a certain way and not in some other way.[16] And, because the "some other way" cannot be made concrete in a contrived control group, it must be either created in the social scientist's imagination or approximated by locating comparable historical settings. Yet at the same time the social scientist is constrained to observe the same methodological canons that govern explanation by the powerful experimental method. Because of the nature of his data, however, he must rely on various imperfect substitutes for this method. What are these substitutes?

(2) The statistical method, applying mathematical techniques to populations and samples of events containing large numbers, attempts to achieve the same transformation of potentially operative conditions into parameters as does the experimental method. The main difference between the two is that experimentation

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[16] In his methodological essay Weber defined the objectives of systematic historical investigation as follows: "We wish to understand on the one hand the relationships [among] historical events... and on the other the causes of their being historically so and not otherwise." Max Weber, The Methodology of the Social Sciences (Glencoe, Ill.: The Free Press, 1949), p. 72. Italics in original.

does so by situational manipulation whereas statistical analysis does so by mathematical manipulation that either holds constant or cancels out sources of variation or shows them to be actually inoperative.[17]

The statistical method can be understood by describing it point for point in terms of the several advantages of the experimental method just reviewed. First, with respect to isolating independent variables, the statistical method proceeds by correcting for known sources of variation or by showing suspected sources of variation to be spurious. An example of correcting for variation is seen in time-series analysis in economics. Suppose we wish to trace the influences on the long-term trend of potato prices over several years. We know that potato prices vary seasonally as well as year by year, but we do not wish to measure the seasonal variation. So we calculate the average seasonal variation for fifty years, and cancel out seasonal fluctuations for each individual year by adding or subtracting the average seasonal variation from the actual prices. In this way we come closer to removing the seasonal fluctuations, and thus obtaining a truer picture of uncontaminated long-term price trends. Suppose also that over the fifty-year period in question, the economy has experienced a steady inflationary trend. To correct for this trend, and thus arrive at a truer picture of forces influencing potato prices alone, we deflate the potato price series by the rate of general price inflation. By these statistical operations we make parameters of seasonal fluctuation and general monetary inflation, and are thereby enabled to relate trends in potato prices more precisely to other determinants. A similar sort of operation is frequently found in the sociological analysis of intergenerational social mobility. Over an intergenerational period some social mobility (defined as differences in

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[17] To avoid misinterpretation of this main difference, I should point out that I do not mean to include under "statistical method" all those techniques and procedures used in science that are labeled "statistical." Indeed, many statistical models are readily applicable to the interpretation of experimental situations. The distinction I wish to emphasize is between the methods of setting up a situation to produce data for the investigator's specific purposes of controlling variables$_x$ (which I am calling "experimental" methods) and the methods of manipulating variables mathematically with respect to data that are produced empirically without reference to the investigator's purposes (which I am calling "statistical" methods).

occupational status between father and son) is required simply by virtue of long-term structural changes in the occupational structure itself. If the tertiary sector is expanding, for example, more sons will necessarily move from other backgrounds into service industries. Investigators of mobility frequently wish to inquire into determinants other than changing industrial structure--determinants such as family size, ordinal position of son in family, or achievement motivation. To isolate these other determinants, the investigator calculates a mobility rate that is to be expected solely on the basis of structural changes alone, subtracts this rate from the gross mobility rate, and analyzes the difference in terms of the other suspected independent variables. In this way the effect of the structural changes is held constant--made into a parameter--for purposes of further analysis.[18]

The method of ruling out possibly spurious relations and thus isolating genuine ones is best illustrated by referring to multivariate analysis as practiced in survey research. Suppose that it is discovered in a national survey that age is positively correlated with political intolerance. Suppose also that level of education is found to be negatively correlated with intolerance. Since age and educational level are themselves correlated (above the age of completed education, young people are more educated than old people), it is impossible to ascertain, on the basis of the two correlations alone, if age, or educational level, or both, or neither is a determinant of intolerance. To gain this knowledge, a method of partial correlation is applied: holding education constant, what is the apparent influence of age? And holding age constant, what is the apparent influence of education? By carrying out a succession of such operations, both on the two variables in question and on other variables associated with them, the investigator

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[18] For an example of research on social mobility using this kind of statistical manipulation, cf. Natalie Rogoff Ramsøy, "Changing Rates of Mobility," in Neil J. Smelser and Seymour Martin Lipset (eds.), Social Structure and Social Mobility in Economic Development (Chicago: Aldine Press, forthcoming).

makes parameters of a number of possibly operative conditions and arrives at a more accurate statement of the actually operative conditions.[19]

With respect to the measurement of variables, it is possible that statistical investigation will be based on finely measured and readily quantifiable data. If so, the statistical method will approximate the experimental method, where it is possible for the investigator to arrange that the variables are readily measurable. As a general rule, however, statistical analysis must rest on measures that are inferior to measures in experimentation. The general reasons for this are two: First, the variables of the social sciences (e.g., complex attitudes) have proved more difficult to measure reliably than many of the variables of the experimental natural sciences. Second, in uncontrolled historical investigation, unlike controlled experimentation, the frame of reference of the data-producing actors or agencies (e.g., the Census Bureau) if often different from the frame of reference of the investigator; the data, in other words, are not produced or measured with an eye to any particular scientific investigation. Investigators must therefore accept historically given measures, rather than measures geared specifically to a particular scientific inquiry.

Finally, with respect to the possibility of controlling time, statistical analysis of historical data is also at a disadvantage to the experimental method. Statistical manipulation is usually performed on two types of data, both of which make for difficulty in controlling time. First, with respect to statistical data procured at a single moment in time (census data, cross-sectional survey data), temporal precedence cannot be readily established, because all classes of

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[19] For an extended exercise that used the variables of age, education, and various measures of intolerance, cf. Samuel A. Stouffer, Communism, Conformity and Civil Liberties: A Cross-section of the Nation Speaks Its Mind (Garden City, N.Y.: Doubleday, 1955), pp. 89-108. Stouffer actually found both age and education correlated with intolerance, even after correcting for the influence of each on the other. For a brief general discussion of this method as applied to the wartime research on the American soldier, cf. Patricia L. Kendall and Paul F. Lazarsfeld, "Problems of Survey Analysis," in Robert K. Merton and Paul F. Lazarsfeld (eds.), Continuities in Social Research: Studies in the Scope and Method of "The American Soldier" (Glencoe, Ill.: The Free Press, 1950), pp. 136-141.

variables--whether assumed to be independent, intervening, or dependent--must be regarded as occurring at the same moment. Second, with respect to statistical data that unfold in an uncontrolled way in the course of historical events, "before-after" inferences are difficult to make, and causal priorities are correspondingly difficult to establish.

Two common devices are used in the social sciences to overcome the difficulties of controlling time. The first is the use of the time lag, both as an analytic assumption and as a research procedure, in investigating associations. This is most widely used in the study of economic dynamics. In his theory of the trade cycle, for example, Hicks posited a time lag of three months between investment and the consumption effect of investment.[20] In his analysis Hicks made no effort to apply this presumed time lag to any particular data to see if investment and consumption appear to unfold empirically in keeping with the assumed relation and lag. Kalecki, in developing his theory of investment and the business cycle, posited two time lags--one between investment decisions and actual investment in fixed capital, and the other between investment in inventories and the rate of change in the private sector of the economy. Then, assigning a range of values to these time lags, Kalecki proceeded to interpret the fluctuations of investment, gross product, etc., in the American economy between 1929 and 1940.[21] The nature of this operation is that the dependent variables (investment in the one case and change in production in the private sector in the other) are lagged systematically behind the independent variables (decision to invest in the one case and investment in the other) with the assumption that changes in the causally prior independent variables will precede changes in the dependent variables. If, by this assumption, various data can be more plausibly interpreted than by assuming

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[20] J. R. Hicks, A Contribution to the the Theory of the Trade Cycle (Oxford: at the Clarendon Press, 1959), Chapter II.

[21] M. Kalecki, Theory of Economic Dynamics: An Essay on Cyclical and Long-run Changes in Capitalist Economy (New York: Rinehart, 1954), Parts 4 and 5.

no lag or assuming an opposite lag, this creates a presumption in favor of the causal priority that is contained in the theory.[22]

A sociological example of the attempt to establish causal priority by reference to time lags is found in the effort of Henry and Short to discover relations between fluctuations in the suicide rate and fluctuations in business activity. Beginning with Durkheim's prediction that extraordinary windfalls in periods of speculation are disorienting and give rise to anomic suicide,[23] Henry and Short predicted that if this were the case, suicide would be positively correlated, especially among males, with rapid increases in the business index. Examining their own data, Henry and Short found that the low point of the male suicide rate was reached just before the peak of business expansion. The slight increase of suicide just before the peak of business expansion, moreover, was contributed primarily by the female, not the male rate.[24] This led Henry and Short to reject Durkheim's hypothesis relating business prosperity and anomic suicide. Furthermore, the grounds on which they rejected it rest on the logic of the time lag: if prosperity were genuinely causal, suicide rates should have accompanied business activity upward, perhaps with a slight lag; but since the opposite relation held, the causal connection cannot be drawn.

The second device used to control time is the panel method. In its first thorough application, a sample of voters were interviewed repeatedly over six months to gain a measure of their changing voting intentions. In addition, various

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[22] For an example of an attempt to assign causal priority to factors in business cycles on the basis of temporal priority, or "leads," cf. Arthur D. Gayer, W. W. Rostow, and Anna Jacobson Schwartz, The Growth and Fluctuation of the British Economy 1790-1850 (Oxford: at the Clarendon Press, 1953), pp. 531-550.

[23] Emile Durkheim, Suicide (Glencoe, Ill.: The Free Press, 1951), pp. 241-254.

[24] Andrew F. Henry and James F. Short, Jr., Suicide and Homicide: Some Economic, Sociological and Psychological Aspects of Aggression (Glencoe, Ill.: The Free Press, 1954), pp. 42-44.

other data that might be relevant as determinants of changes in intention (exposure to mass media, personal contacts, etc.) were gathered. Because several observations of different variables were made at different points in time, the investigators were able to determine whether changes in the presumed independent variables actually occurred before changes in the dependent variables--in this case voting intention.[25] If they did occur before, the investigators could place greater confidence in their assertion that the presumed independent variables were causal. In this way the panel technique approximates the experimental method; the main difference is that in experimentation the investigator introduces the independent variable himself at an appropriate time, whereas in the panel method the investigator records its introduction, which he cannot control. But in both cases, time is systematically controlled, with the end in view of facilitating causal inferences.[26]

(3) The comparative method, like the statistical method, is an imperfect substitute for experimentation. Unlike the statistical method, however, it is employed in the scientific analysis of historical data, the number of cases of which is too small to permit mathematical manipulation. This method is evidently required in the comparative analysis of national units, which are few in number, but may also be required in comparing regions, cities, communities, and other sub-national social units. Because of the restricted number of cases, the investigator is forced to rely on the method of systematic comparative illustration.

Despite this unique restrictive feature, the logic of the comparative method is identical to the logic of the methods just reviewed in that it attempts to attain scientific explanation by systematically manipulating parameters and operative variables. A classic example will show this identity. One of Durkheim's

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[25] Paul F. Lazarsfeld, Bernard Berelson, and Hazel Gaudet, The People's Choice: How the Voter Makes up his Mind in a Presidential Campaign (New York: Columbia University Press, 1948), pp. 3-8.

[26] Kendall and Lazarsfeld, "Problems of Survey Analysis," op. cit., pp. 142-145. For an elaboration of these simple assumptions into quite a complex technique, cf. Donald C. Pelz and Frank M. Andrews, "Detecting Causal Priorities in Panel Study Data," American Sociological Review, XXIX, 6 (December, 1964) pp. 836-848.

central findings in his study of suicide was that Protestants persistently display higher rates of suicide than Catholics.[27] The variable he employed to explain this finding was integration: Protestants, with their individualistic, anti-authoritarian traditions, are less integrated into a religious community than Catholics and hence less protected against self-destruction. On examining the countries on which his religious data were available, however, Durkheim noticed that Catholics were in the minority in every case. Could it not be, he asked, that minority status rather than religious tradition is the operative variable in the genesis of lower suicide rates among Catholics? To throw light on this question he examined regions such as Austria and Bavaria, where Catholics were in the majority; in these regions he discovered some diminution of differences in suicide rates between Protestants and Catholics, but Protestant rates were still higher. On the basis of this examination, he concluded that "Catholicism does not owe [its protective influence] solely to its minority status."[28] In this operation Durkheim used no statistical techniques; yet he was approximating their use through systematic comparative illustration. He was making minority status into a parameter to isolate the distinctive influence of the religious variable.

The comparative method is frequently divided into two types, positive and negative. Another classic example--Max Weber's studies on religion and rational bourgeois capitalism--will illustrate this difference. Given that certain societies (mainly in Northwest Europe and North America) had developed rational bourgeois capitalism, Weber asked what characteristics these societies had in common. In so doing he was using the positive comparative method--identifying similarities in independent variables associated with a common outcome. Then, turning to societies that had not developed this kind of economic organization (e. g., classical India, classical China), he asked in what respects they differed from the former societies. In so doing he was using the negative comparative method--identifying differences among independent variables associated with divergent outcomes. By

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[27] Suicide, op. cit., pp. 152-156.

[28] Ibid., p. 157.

thus manipulating the independent variables and the outcomes. Weber built his case that differences in religious systems were crucial in accounting for the different economic histories of the various societies.[29] Translating Weber's comparative analysis into the language of scientific inquiry, we can say that he was making parameters of features shared by both the West and his Oriental cases (for instance, he ruled out the influence of merchant classes on industrial development by pointing out that both China and the West had these classes prior to the development of capitalism in the West); and he was making operative variables of those religious features not shared by the West and the Oriental cases. The Oriental societies that did not develop capitalism are logically parallel to control groups (because they were not affected by the crucial variable of other worldly ascetic religion); the countries of the West are logically parallel to experimental groups (because the crucial variable was operative).

Since the comparative method must be relied on disproportionately in drawing inferences about post-attack society, I shall devote the next section to discussing some distinctive issues and problems that arise in employing this method. At present, I shall review its characteristics in terms of the three advantages cited above for the experimental method. First, with respect to isolating operative variables, the comparative method stands at a disadvantage to both the experimental and statistical methods because the investigator can manipulate conditions neither situationally nor mathematically. He must rely on even more imperfect types of manipulation, such as illustrative replications at different analytic and empirical levels, deviant case analysis, elaboration, and so on. I shall illustrate these types of manipulation later. I might note at present that the comparative method and the statistical method shade into one another with respect to the isolation of variables and associations among them. As soon as the number of units to be compared becomes large enough to permit the use of statistical techniques, the line between the two is crossed. In his classic comparative study, Social Structure, Murdock compiled data on 85 societies from the Human Relations Area files, and

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[29] Relevant works include The Protestant Ethic and the Spirit of Capitalism (London: Allen & Unwin, 1948); The Religion of China (Glencoe, Ill.: The Free Press, 1951); The Religion of India (Glencoe, Ill.: The Free Press, 1958).

acquired comparative data on 165 other societies from the general anthropological literature. Having an N of 250 to deal with, Murdock could go beyond the method of systematic comparative illustration and use statistical methods such as Yule's Coefficient of Association and Chi Square.[30] With respect to those exceptional cases that did not reflect the general patterns of association, however, Murdock saw the necessity of returning to the method of systematic comparative illustration: "It [is] scientifically desirable to examine every negative or exceptional case to determine the countervailing factors apparently responsible for its failure to accord with theoretical expectations. . . ."[31] The investigator, then, must be prepared to shift back and forth between statistical and comparative methods according to the character of his data.

With respect to the measurement of variables, the comparative method suffers the same disadvantage as the statistical method, since most available data are historical data, precipitated or produced from social behavior that has transpired without reference to the scientific purposes of the investigator. Therefore it may not be represented in appropriate form for purposes of the investigation at hand.

Finally, because of the qualitative character of much historical data, and because almost all of it has unfolded in the flow of historical events, the comparative method suffers even more than the statistical method from the inability to control time and thereby to establish before-after relations and, by derivation, causal relations. Some historical events--outbreaks of wars, assassinations of political leaders, natural catastrophes, and so on--do occur at definite times and do constitute definite breaking points around which we may speak of a "before" and an "after." But such events are not necessarily the most important ones from the standpoint of systematic comparative investigation.

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[30] Social Structure, op. cit., pp. vii-x.

[31] Ibid., p. ix. See also Murdock, "The Cross-Cultural Survey," American Sociological Review, V, 3 (June, 1940), p. 370.

Two examples of the limitations of the comparative method in establishing before-after relations may be cited. In interpreting the observed association between child-training practices and adult belief about the origin of disease, Whiting and Child held child-training practices to be independent variables, personality factors to be intervening variables, and adult projective beliefs to be dependent variables.[32] In reviewing their interpretation of these findings, the authors permitted themselves the following speculation: "Let us imagine for the moment that our findings are due entirely to an effect of adult personality characteristics upon child training practices."[33] Since the authors had evidence only on the close association between child-training practices and adult beliefs--and no evidence on the temporal priority of either--this speculation appears as plausible as the psychoanalytic interpretation set forth by the authors. Whiting and Child realized this when they observed that "it is an unfortunate defect of the correlational method. . . that it can provide no conclusive evidence about the direction of causal relationships."[34] The authors were correct, then, in calling for further research on the clinical histories of individuals--in which the time factor can be observed--to sort out the temporal and causal priorities among the variables they found to be associated.

A second example is found in the swirl of controversy that has surrounded the Weberian thesis on religion and the rise of capitalism. One of the criticisms of Weber is that his thesis lacks validity because--as one critic put it--"Europe was acquainted with capitalism before the Protestant revolt. For at least a century capitalism had been an ever growing collective force."[35] In one sense such a criticism is unfair to Weber, since he insisted on the interaction among economic

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[32] Above, pp. 544-546.

[33] Child Training and Personality, op. cit., p. 318.

[34] Ibid., p. 319.

[35] Amintore Fanfani, "Catholicism, Protestantism and Capitalism," in Robert W. Green (ed.), Protestantism and Capitalism: The Weber Thesis and Its Critics (Boston: D. C. Heath, 1959), p. 87.

factors and ideas rather than the exclusive causal impetus on either side.[36] At the same time, however, the criticism does highlight the difficulties of sorting out precise causal relations among historical phenomena, because of the difficulty of controlling time and establishing before-after relations.

Before moving to a more detailed consideration of the comparative method, I shall discuss the methodological status of two other methods--the method of heuristic assumption and the case method.

(4) The method of heuristic assumption is a very widely employed method of transforming potentially operative variables into parameters. The most familiar version of this method is the economists' famous strategy of ceteris paribus--other things equal. Economists explicitly assume, for instance, that for purposes of many economic analyses various non-economic factors--especially institutions and tastes--must be assumed to be constant, i. e., must be treated as parameters. Economists also have traditionally assumed some version of the postulate of economic rationality: If an individual is presented with a situation of choice in an economic setting, he will behave so as to maximize his economic position. By extensive use of this method of simplifying sources of variation, economic analysts have been able to reduce the number of operative variables to a manageable number and create relatively simple and elegant models of economic variables; the extensive use of this method, in fact, accounts in part for the level of theoretical sophistication of the field of economics.

Helpful and necessary as the method of heuristic assumption has been in fields such as economics, it is in many important respects inferior to the methods of experimentation, statistical analysis, and comparative analysis. The reason for this is that the method of heuristic assumption rests on no form of situational or conceptual manipulation other than making simplifying assumptions. Seldom if ever are serious attempts made to establish the empirical validity of the assumptions or to "correct" for the degree to which the assumption is not valid. The method of heuristic assumption accomplishes by "making believe" what the other methods

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[36] The Protestant Ethic and the Spirit of Capitalism, op. cit., p. 23.

accomplish by situational or conceptual manipulation in the light of some known or suspected empirical variation. Nevertheless, despite the fact that heuristic assumptions do their job imprecisely and without benefit of being empirically informed, they provide the investigator the same kind of service as the experimental, statistical, and comparative methods--systematically to transform operative conditions into parameters to permit the isolated investigation of a limited number of selected operative conditions.

In fields other than economics, the method of heuristic assumption is as widely but not as explicitly employed as in economics. In an experimental small-group setting, for example, in which the influence of different leadership structures on morale is being investigated, the investigator makes use of a number of important but unexamined heuristic assumptions--that the subjects speak the same language, that they operate under many common cultural assumptions, that they are more or less uniformly motivated to participate in the experiment, and so on. All these factors, if treated as operative variables, would certainly influence the outcome of the experiment; but they are implicitly assumed not to be operative variables--i. e., to be parameters--for purposes of analysis. To choose another example, studies of voting behavior proceed on the assumption that voting behavior takes place within an unchanging constitutional, legal, and electoral framework. This framework, if varied, would certainly influence the rates and directions of voting. But for the purposes of analysis, the investigator assumes this framework to be parametric.

(5) The case study method can be subdivided into two types: deviant case analysis and isolated clinical case analysis. The former is explicitly a species of comparative analysis, the latter only implicitly so. Let me illustrate the difference.

The method of deviant case analysis is understood only in relation to some larger statistical or comparative analysis, in which an association--and presumably a causal connection--has been established. The starting point, in fact, for deviant case analysis is "the empirical fact that no statistical relationship, particularly in the social sciences, is a perfect one."[37] In deviant case analysis, the investigator

[37] Kendall and Lazarsfeld, "Problems of Survey Analysis," op. cit., p. 167

takes the instance or instances that are exceptions to the general association, and attempts to locate independent variables that distinguish them from the majority of cases and thus override the general association.

Methodologically, deviant case analysis parallels the negative comparative method. That is to say, the investigator takes two "groups" that differ in outcome (dependent variable) and attempts to locate differences in conditions between them (independent variables). In deviant case analysis, one "group" is the deviant case itself, the other the majority of cases expressing the more general association. The comparative operation is also logically parallel to Weber's method of determining in what ways classical India (which did not develop rational bourgeois capitalism) differed from the countries of Northwest Europe and North America (which did so); in Weber's example the "deviant case" would be India, which shared some characteristics (a tradition of high civilization, a complicated stratification system, etc.) with the West, but did not produce the same kind of economic system.

The method of deviant case analysis can also be viewed as a process of "reading backwards" to approximate the experimental situation. In an experiment the independent variable is varied as between experimental and control groups to produce different outcomes. In deviant case analysis the starting point is the different outcome itself (as between the deviant case and the majority of cases); the investigator then "reads back" to presumed operative conditions to determine the respects in which the conditions affecting the deviant case (the "experimental group" by parallel) differ from the conditions affecting all the other cases. The main difference between deviant case analysis on the one hand and experimental and statistical methods on the other is that the N of the exception is always one or a few, so that it is difficult to discern which of the many respects in which the deviant case differs from the majority of cases is the important one. For this reason deviant case analysis cannot be regarded as "establishing" findings in the same sense as the other methods--experimental, statistical, and to a lesser extent comparative--but must be regarded as a method of refining or locating new variables, which can then be established or rejected by the application of more powerful research methods.

An example of the usefulness of deviant case analysis can be found in a typical study of cross-cultural association. In a comparative analysis of the incidence of sorcery as a cultural explanation of the onset of disease, Beatrice Whiting hypothesized that in societies that had an authority delegated to mete out sanctions against murder, sorcery would not occur as an explanation of disease; whereas in societies in which murder was settled by retaliatory methods sorcery would be widespread. Taking fifty societies as a sample, she found that the association between sorcery and the presence of a superordinate system of justice was significant in the predicted direction. Despite this strong association, it was apparent that "Africa was strikingly aberrant, all but three of the nine tribes sampled having sorcery as an important explanation for sickness and not coordinate but superordinate control."[38] Taking these African societies as deviant cases, she decided to " [analyze the material] in more detail to see if some other variables could be discovered."[39] (This is the essence of deviant case analysis.) Starting from Evans-Pritchard's account of sorcery among the Azarde, she discovered that in this society justice is in fact decided on by delegated authorities--oracles and chiefs--but the actual retaliation is executed by relatives of the slain party with the permission of the authority. On the basis of this information, Whiting " [reclassified] all tribes, distinguishing between superordinate justice and superordinate punishment, " and recalculated a number of correlations on the basis of this more refined conception of social control.[40] In this particular case the method of deviant case analysis led to the refinement of the same variable--type of social control--that was important in the original association; in other cases it could lead to the discovery of entirely new variables.

Isolated clinical case analysis involves the investigation of an individual unit with respect to a certain analytic problem. It differs from deviant case

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[38] Beatrice Blyth Whiting, Paiute Sorcery (New York: Viking Fund Publications in Anthropology No. 15, 1950), pp. 84-85.

[39] Ibid., p. 85.

[40] Ibid., pp. 86 ff.

analysis in that it is not conducted in such intimate connection with a known statistical regularity that produces notable exceptions. Gouldner's study of the deleterious effects of managerial succession on worker morale in a single gypsum plant is an example of a clinical case study.[41] Yet insofar as the study is couched in a general conceptual framework and related to other general findings on formal organizations, it becomes explicitly a comparative study. When Gouldner, for example, related his findings to some of Weber's propositions on bureaucracy, he was pointing out that the particular case he studied differed in certain respects from the general associations claimed by Weber, and was isolating certain variables that would account for the difference. In this respect the clinical study comes to approximate deviant case analysis, or the negative comparative method. In a later case study Guest isolated an instance of smooth and successful managerial success in another plant.[42] In contrasting his results with those of Gouldner, and in attempting to isolate the variables that underlay the differences in the findings of the two studies,[43] Guest was bringing the negative comparative method to bear on the general associations between authority and worker response implied in Gouldner's case study.

In this section I have attempted to show the basic continuity between five methods--experimental, statistical, comparative, heuristic assumption, and case study--that are widely used in scientific inquiry. All these methods have two features in common: they are ways of organizing independent, intervening, and dependent variables in relation to one another; and they are ways of organizing independent variables into parameters and operative variables to isolate, measure and establish the precise causal role of specific independent variables. The methods differ in efficacy, however, because each faces unique constrictions on number and kinds of data under investigation.

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[41] Alvin W. Gouldner, Patterns of Industrial Bureaucracy (Glencoe, Ill.: The Free Press, 1954).

[42] Robert Guest, Organizational Change: The Effect of Successful Leadership (Homewood, Ill.: Dorsey, 1962).

[43] Guest, "Managerial Succession in Complex Organizations," American Journal of Sociology, LXVIII, 1 (July, 1962), pp. 47-54. See also the comment by Gouldner and rejoinder by Guest, pp. 54-56.

Some Problems of Comparability in Different Socio-cultural Contexts

In attempting to draw inferences about the consequences of nuclear attack, it is necessary to rely heavily on some variant of the comparative method. The social units being compared in this particular case are, first, the hypothetical post-attack society, and second, known historical situations that resemble post-attack society in certain respects. Since this operation involves comparing social phenomena in very diverse socio-cultural settings, it raises all the problems of comparability that plague the method of comparative analysis in general. In this section I shall review some of these problems in general terms; in the next section I shall apply them to the analysis of post-attack society.

To introduce the problems of comparability, I shall review Radcliffe-Brown's succinct statement of the advantages of the comparative method.[44] To demonstrate these advantages, he began with a specific example--the existence of exogamous moieties named after the eaglehawk and the crow in a certain region in Australia. Instead of concentrating on the highly specific historical factors which might account for the evolution of this particular division in this particular region, Radcliffe-Brown decided on another strategy: the comparative strategy. He turned to other societies, both in Australia and elsewhere, and discovered that the division of the social order into opposed groupings based on animal identities was very widespread. By thus enlarging his perspective Radcliffe-Brown substituted "certain general problems," demanding general explanations, for "a particular problem of the kind that calls for a historical explanation." These general problems were, for instance, the problem of totemism--the association of a social group with a natural species--and, even more generally, the "problem of how opposition can be used as a mode of social integration." By using this comparative, generalizing strategy, moreover, Radcliffe-Brown was able to locate general sociological variables which could be brought back to bear on the explanation of the particular division between the eaglehawk and crow moieties in the Australian tribes. Summarizing the advantages of his comparative strategy, Radcliffe-Brown commented,

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[44] A. R. Radcliffe-Brown, Method in Social Anthropology (edited by M. N. Srinivas) (Chicago: University of Chicago Press, 1958), pp. 126-127.

" [the] comparative method is. . . one by which we pass from the particular to the general, from the general to the more general, with the end in view that we may in this way arrive at the universal, at characteristics which can be found in different forms in all human societies."[45]

In connection with this comparative method, three interrelated sets of problems arise, all of which can be subsumed under the heading, "The Problem of Comparability": (1) How can we be certain that the events and situations we wish to explain--the dependent variables--are comparable from one socio-cultural context to another? How, for example, can crime rates a century ago be compared with crime rates now? Were not recording procedures different then from now? Was not the social meaning of a crime different then from now? Or, turning to Radcliffe-Brown's example, how can we compare social groupings such as moieties in various societies with one another, when the social meaning and context of these groupings differ from society to society? (2) A related but more general way of putting these questions is: How can we be certain that the dimensions used to compare societies cross-culturally do not distort the events and situations being compared? For example, suppose we wish to compare the "political" aspects of two societies with very different cultural traditions and social structures. In what sense does the concept "political" apply both to the role of an African chieftain and to that of an American legislator? In what sense are both "political" roles rather than some other kind of roles?[46] Or, to use Radcliffe-Brown's example, in what

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[45] Ibid., p. 127. Radcliffe-Brown's account of these advantages is similar to Whiting's brief characterization of the advantages of the comparative method: "The advantages of the cross-cultural method are twofold. First, it ensures that one's findings relate to human behavior in general rather than being bound to a single culture, and second, it increases the range of variation of many of the variables." John W. M. Whiting, "The Cross-Cultural Method," in Gardner Linzey (ed.), Handbook of Social Psychology, Vol. I, Ch. 14 (Cambridge, Mass.: Addison-Wesley, 1954), p. 524.

[46] Elsewhere Radcliffe-Brown recognized the importance of this kind of question when he asserted: "If we are to study political institutions in abstraction from other features of social systems we need to make sure that our definition of 'political' is such as to mark off a class of phenomena which can profitably be made the subject of separate theoretical treatment." A. R. Radcliffe-Brown, "Preface," to M. Fortes and E. E. Evans-Pritchard (eds.) African Political Systems (London: Oxford University Press, 1955), p. xii.

sense is it legitimate to interpret social groupings such as moieties as reflecting "opposition. . . used as a mode of social integration"? Certainly some general dimension is necessary for engaging in comparative analysis; otherwise the investigator is committed to a particularism and relativism that prohibit him from moving beyond the confines of a single social unit.[47] But the soundness of this general point does not indicate which particular comparative dimensions do least violence to the distinctive socio-cultural meaning of events and situations, and at the same time provide a genuine basis for comparative analysis. (3) Moving to an even more general way of posing the question of comparability, we might ask: How is it possible to compare very different social units (or social systems) with one another? Does it make any sense to compare a highly complex nation-state like the United States with a hunting-and-gathering tribe in Australia, when it is obvious that they differ from one another in almost every conceivable respect?

The amount of difficulty generated by these three questions rests entirely on how adequately the investigator chooses and operationalizes his comparative dimensions. Let us explore this criterion in greater detail.

The first rule of thumb for the investigator is to avoid concepts that are so tied to a particular culture or group of cultures that no instance of the concept, as defined, can be found in other socio-cultural settings. The concept, "civil service," for example, is so intimately linked with a bureaucratic administrative form that it literally cannot be instantiated in societies without a formal state or governmental apparatus. The concept, "administration," is somewhat superior, since it is not so intimately tied to particular forms of bureaucracy, but even this term is quite culture-bound. Weber's concept of "staff"[48] is an even more helpful

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[47] Clyde Kluckhohn, "Universal Categories of Culture," in A. L. Kroeber (ed.), Anthropology Today: An Encyclopedic Inventory (Chicago: University of Chicago Press, 1953), p. 520.

[48] Max Weber, The Theory of Social and Economic Organization (New York: Oxford University Press, 1947), pp. 329 ff.

term, since it can encompass, without embarrassment, various political arrangements based on kinship and other forms of particularistic loyalties. "Staff" is more satisfactory than "administration," then, and "administration" more satisfactory than "civil service," because the former allow for more nearly universal instantiation.

Merely to select a concept that can be illustrated empirically in a large number of societies, however, is not sufficient. Comparability also depends on how the concept is identified in different socio-cultural settings. To underscore the importance of this point, let me illustrate from the field of economics. Clearly the term "economic" is a concept that is in principle universally identifiable. All societies face the problem of scarcity of natural resources and human skills, and all societies come to terms in some institutionalized way with this problem of scarcity. Thus all societies have an "economic problem" and display "economic behavior." To say this, however, is only to begin an adequate comparative account of economic behavior. It is also necessary to ask how economic behavior is identified, in terms of actual operations, in different socio-cultural contexts. How have economists handled this problem?

One convenient and widely-used method to identify "economic" is to limit the empirical referents of the term, as did Alfred Marshall, to those aspects of men's attitudes and activities which are subject to measurement in terms of money.[49] From the standpoint of empirical precision, such an index has obvious advantages. From the standpoint of encompassing economic behavio on a uniform and universal basis, however, the index has severe limitations. Even in our own society, many economic activities--housewives' labor, lending a hand to a friend, etc.--are seldom expressed in monetary terms. In the case of economics based on subsistence farming and domestically-consumed household manufacture, the limitations of the monetary index are more evident, since the most fundamentally economic kinds of behavior--production, distribution, and consumption of foodstuffs--never become monetized. In addition, the monetary index is restricted

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[49] Alfred Marshall, Principles of Economics, Eighth edition (New York: Macmillan, 1920), pp. 14-28.

from the standpoint of comparing a growing economic system with its own past, since one of the concomitants of economic growth is the entry of an increasing proportion of goods and services into the market context--and hence their increasing monetization. Thus if the monetary definition of "economic" is used, the rate of growth will be artificially "inflated" by virtue of the fact that non-monetized economic activity is transformed into monetized economic activity.[50]

Despite these limitations of the monetary index in representing the dimension, "economic," it is employed frequently in international comparisons. Scholars and laymen alike are familiar with comparisons of per capita per annum income of the nations of the world, ranging from around two thousand dollars for the United States to less than one hundred dollars for some underdeveloped countries.[51] Such figures are inadequate as comparative measures for at least two reasons: (1) Being based on monetized aspects of economies, they underestimate the income levels of subsistence and other kinds of economies with limited monetization.[52] (2) They involve translations of various currencies into dollar equivalencies, usually on the basis of existing international currency exchange ratios. Since many of these ratios are "pegged" artificially and do not represent true economic exchange rations, additional bias creeps into the comparative estimates.

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[50] Some definitions of economics do not limit economic activity to monetized activity. Thus Samuelson's textbook definition is "...the study of how men and society choose, with or without the use of money, to employ scarce productive resources to produce various commodities over time and distribute them for consumption, now and in the future, among people and groups in society." Paul A. Samuelson, Economics: An Introductory Analysis, 5th edition (New York: McGraw-Hill, 1961), p. 6. Emphasis added.

[51] For an example, see United Nations, "Levels and Sources of Income in Various Countries," reprinted in Lyle W. Shannon (ed.), Underdeveloped Areas (New York: Harper & Brothers, 1957), pp. 22-25.

[52] S. Herbert Frankel, The Economic Impact on Underdeveloped Countries (Cambridge, Mass.: Harvard University Press, 1953), pp. 29-55.

Another possible definition--also oversimplified--of "economic" has been suggested in the work of Polanyi, Arensberg, and Pearson.[53] Reacting negatively to the preoccupation of formal economics with market economies, these authors suggest that economic activity be defined as that instituted process which results in a "continuous supply of want-satisfying material means." This material index introduces a bias precisely opposite to that of the monetary index--a bias in favor of the primitive and peasant societies. In such societies it appears (but is not necessarily the case) that economic activity is devoted to material subsistence--food, clothing, and shelter. In advanced market societies, however, in which expressive behavior, ideas, personalities, and other non-material items have economic value, the formula of the "economic" as the "supply of want-satisfying material means" collapses as an adequate comparative tool. It is as illegitimate to try to force a material bias on all economic activity as it is to impose a fully-developed market analysis on all economic activity.[54]

Any encompassing definition and measurement of economic activity, then, must involve more than some convenient measure of monetized activity or physical production. It must involve a definition of the production, distribution, and consumption of scarce goods and services in relation to individual and social goals. Economists have long recognized this relational quality of economic activity in their preoccupation with utility as the basis of economic value; yet their preoccupation has been predominantly in terms of the wants of individuals, notwithstanding the tradition of welfare economics that has pursued questions of inter-individual comparability and community welfare.[55] Furthermore, economists have generally

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[53] K. Polanyi, C.M. Arensberg, and H.W. Pearson (eds.), Trade and Market in the Early Empires (Glencoe, Ill.: The Free Press and the Falcon's Wing Press, 1957).

[54] For further development of this point and further criticism of the formulation put forth by Polanyi, et al., see Neil J. Smelser, "A Comparative View of Exchange Systems," Economic Development and Cultural Change, VII, 2 (January, 1959), pp. 173-182.

[55] See, for example, I.M.D. Little, A Critique of Welfare Economics (Oxford: at the Clarendon Press, 1950); Jerome Rothenberg, The Measurement of Social Welfare (Englewood Cliffs, N.J.: Prentice-Hall, 1961).

tended to treat wants (goals) as "given" and therefore subject to no further analysis.[56] But in comparing very diverse cultural systems the question of wants as the ultimate defining basis for economic activity and economic measurement cannot be taken as simply "given." The definition and measurement of economic activity--if it is to be genuinely comparative--must take more direct account of societal goals. To illustrate: We may assume that a society possesses a value-system which defines certain goals as desirable for unit members of society at various levels. By a process of institutionalization, the appropriate channels for realizing these goals are specified. It is apparent, however, that the complete and instantaneous realization of these goals cannot be guaranteed. Hence an inherent part of a society's situation is that certain institutionalized attention be given to the supply of various facilities to attain the valued goals. Part of this attention is economic activity. The goals--and the institutionalized means for attaining them--may vary considerably; they may concern perpetuation of kinship lines, attainment of a state of religious bliss, territorial expansion, or maximization of wealth. Economic activity is defined as a relation between these goals and the degree of scarcity of goods and services. Indeed, the definition of economic in any given society--and the structure of its economy--will be in large part a function of both the institutionalized values and the availability (or scarcity) of human and non-human resources.

In suggesting this definition of "economic," I have attempted to resolve a tension inherent in comparative analysis--the tension between the pole of easy operationalization of an objective index on the one hand and the pole of difficult operationalization of subjective cultural meanings on the other. The comparative analyst is pulled toward the former pole because measurement is easy; but as the monetary and physical indices of the "economic" show, these objective measures are likely to distort the concept. At the same time the comparative analyst is pulled toward the latter pole because he wishes to give adequate representation to what individual cultures themselves define as "economic." This pole is well stated

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[56] Ibid., p. 30.

by Marcel Mauss, who characterized his own comparative methodology as follows: "... since we are concerned with words and their meanings, we choose only areas where we have access to the minds of the societies through documentation and philological research. This further limits our field of comparison. Each particular study has a bearing on the systems we set out to describe and is presented in its logical place. In this way we avoid that method of haphazard comparison in which the institutions lose their local colour and documents their value."[57] Yet if the investigator adheres strongly to this position, he becomes a radical relativist, who must treat everything as "economic" that any society chooses to define as "economic" whatsoever, and hence loses the ability to engage in comparative analysis. I believe the definition of economic activity I have given--a definition that relates social values and meanings on the one hand and scarcity of resources on the other--avoids the pitfalls of both the objectivistic and subjectivistic positions. In constructing definitions for comparative constructs, such as the "economic," the investigator must allow cultural values and meanings to intervene between concepts and their measures. He must begin by comparing systematically the value-systems of different societies, then identify and measure--using a differerent set of operational rules for each society--what classes of activity are scarce in relation to these values. This difficult and prolonged operation is certainly more plagued with problems of operationalization than the simple comparison of market transactions. But comparative analysis cannot proceed far without introducing social values and meanings into the comparative identification and measurement of general constructs; if it does not undertake this task, it will be burdened by uncorrectable distoritions for the very outset.

In attempting to define "economic" as a comparative concept, I have raised a larger set of philosophical and methodological tensions that have long persisted in the social sciences. I refer to the tensions between positivistic objectivism on the one hand (a position that would define social science concepts and indices without any reference to human consciousness and meaning) and

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[57] Marcel Mauss, The Gift: Forms and Functions of Exchange in Archaic Societies (Glencoe, Ill.: The Free Press, 1954), pp. 2-3. Emphasis added.

phenomenological subjectivism on the other (a position that would make social science concepts identical to the meanings that individual actors and groups assign to them). My own position is that definitions and measurements of social-science concepts must both be as objectively measurable as possible and take into account the meaning assigned to the concept by the actors under investigation. Individual and cultural meaning-systems, therefore, must intervene between generalized concept and empirical index.

The tension between the use of a single, easily-operationalized index and the use of diversified indices for comparative purposes is further illustrated in the recent work of Almond and Coleman, who set forth a number of suggestions for the comparative study of political institutions and behavior.[58] Like many other political scientists, Almond and Coleman are dissatisfied with the comparative potential of the traditional categories of political science--categories limited to the complex constitutional political systems of Western society in the nineteenth and twentieth centuries; they do not find them appropriate "for the comparison of political systems differing radically in scale, structure, and culture."[59] In their search for more general categories, Almond and Coleman wish to turn to anthropology and sociology. But on the other hand, they are wary of very general sociological definitions that identify "the political" with concepts like "integration" and "adaptation." Such general definitions represent, they fear, "a return to a dull tool, rather than an advance to a sharper one, for if in pursuit of the political system we follow the phantoms of integration and adaptation, we will find ourselves including in the political system churches, economies, schools, kinship and lineage

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[58] Gabriel A. Almond and James S. Coleman (eds.), The Politics of the Developing Areas (Princeton: Princeton University Press, 1960).

[59] Ibid., pp. 3-4. Compare their statement with one of Radcliffe-Brown: "In the study of the simpler societies the anthropologist finds that the concepts and theories of political philosophers or economists are unserviceable or insufficient. They have been elaborated in reference to societies of a limited number of types. In their place, the social anthropologist has to make for himself theories and concepts which will be universally applicable to all human societies, and, guided by these, carry out his work of observation and comparison." "Preface" to Fortes and Evans-Pritchard (eds.), op. cit., p. xiii.

groups, age-sets, and the like."[60] It seems to me, in fact, that in order to encompass activities that are political, it is necessary to include and measure the activities of churches, lineage groups, and so on, since these social elements are politically significant. I say this in full awareness of the difficulty of assessing and measuring empirically this political significance. Yet Almond and Coleman do not wish to go this far; being ambivalent as between easily operationalizable concepts and general comparative concepts, they end with an in-between definition, somewhat more general than traditional ones, but still not exhaustively comparative in principle: "...the political system is that system of interactions to be found in all independent societies which performs the functions of integration...by means of the employment, or threat of employment, of more or less legitimate physical compulsion."[61] Physical compulsion, like money, is something "hard," easy to operationalize. But to assert that this kind of definition is adequate to analyze political behavior comparatively is erroneous; to be so, it would have to be more general, even if less readily manageable from the standpoint of empirical identifiability.

The tension between easy operationalizability and comparative adequacy has also made its appearance in the theoretical discussions of structural-functional analysis, in particular in the discussion of the "postulate of indispensability." In general terms, the postulate holds that society faces certain universal functional exigencies (such as the socialization of the young, the integration of diverse groups in society) and that certain specific social structural forms alone serve these functions (structural forms such as the nuclear family for socialization and organized religion for integration, for instance). Thus the postulate of indispensability links specific behavioral or institutional indices with general

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[60] Almond and Coleman, op. cit., p. 5.

[61] Ibid., p. 7. Emphasis added. Compare Radcliffe-Brown's definition, which is remarkably parallel: "The political organization of a society is that aspect of the total organization which is concerned with the control and regulation of the use of physical force." "Preface" to Fortes and Evans-Pritchard (eds.), op. cit., p. xxiii. Emphasis added.

social functions, just as the monetary definition of economic activity links "measurement in terms of money" to the general concept of "economic." The formulations are parallel. Objecting to the postulate of indispensability, Merton has asserted that "just as the same item may have multiple functions, so may the same function be diversely fulfilled by alternative items. Functional needs are... taken to be permissive, rather than determinant, of specific social structures."[62] In line with this assertion, Merton goes on to stress the importance of concepts like "functional alternatives," "functional equivalents," and "functional substitutes." Here Merton is opting for general comparative concepts (functions) that encompass a wide variety of empirical manifestations (items). I agree with Merton's emphasis, but recognize that this emphasis creates a host of problems of operationalization when it comes to the actual analysis of the range of structural variations that fulfill general functions.

To conclude this general discussion of the problem of comparability, let us return briefly to the third way the problem was posed at the outset: How is it possible to compare very different social systems--such as primitive societies and advanced industrial societies--with one another, since they differ so radically in so many important respects?[63] In one sense this question has already received an answer: If we choose comparative concepts that are in principle universal, and if we work out operational definitions in accord with the variety of social goals and meanings to which these concepts are related, any society is comparable with any other society. It is clearly possible, therefore, to compare the political system of a hunting-and-gathering tribe with the parliamentary system of Great Britain if the right comparative categories and the appropriate operational definitions are chosen.

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[62] Merton, Social Theory and Social Structure, op. cit., pp. 33-34.

[63] Or, in keeping with the general emphasis of this essay, the question might be phrased: How is it possible to compare contemporary American society with post-attack society, since they would differ from one another in so many important respects.

Above and beyond this general answer, it might be suggested as a matter of research strategy that at the present state of development of comparative analysis it is most fruitful to compare social units that do not differ so radically as do complex parliamentary systems and hunting-and-gathering tribes. It is a very fruitful exercise, for example, to compare the differential incidence of suicide in Denmark, Norway, and Sweden--which are quite close in cultural traditions and social structure;[64] and it is less fruitful to compare the suicide rate of Denmark with that of India, whose cultural traditions and social structure are vastly different. Again, it is particularly appropriate to compare differences in political structure and process among countries with very similar constitutional traditions--for example, the English-speaking democracies of Australia, Canada, Great Britain and the United States.[65] The advantage of this strategy can be stated in terms of the distinction between parameters and operative variables. If two or more societies have some important characteristics in common--cultural traditions as in the case of the Scandinavian countries or the English-speaking democracies; insulation from a continental land mass, as in the case of England and Japan; and so on--it is more nearly permissible to treat these common characteristics as parameters, and proceed to examine the operation of other variables as if these common characteristics were not important operative variables, because their operation is presumably similar in both cases. This ability to convert potentially operative variables into parameters is of general scientific utility.[66] By contrast, if two social units that differ in almost every respect are chosen for comparison, the investigator is forced to consider all sources of difference as operative variables, because he is unable to "control" them by considering them to be similar.

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[64] For a review of various attempts to explain the different suicide rates in the Scandinavian countries, as well as an independent attempt to develop an explanation of the differences based on psychoanalytic variables, cf. Herbert Hendin, Suicide and Scandinavia: A Psychoanalytic Study of Culture and Character (New York: Grune & Stratton, 1964), pp. 1-26.

[65] Seymour M. Lipset, "The Value Patterns of Democracy: A Case Study in Comparative Analysis," American Sociological Review, XXVIII, 4 (August, 1963), pp. 515-531.

[66] Above, pp. 546-548.

The more similar are two or more societies with respect to crucial independent variables, in short, the better able is the social scientist to isolate and analyze the influence of other determinants that might account for the variation he wishes to explain comparatively.

One final strategy remains to be discussed in connection with the problem of comparability. Traditionally it has proved to be burdensome--and still continues to be so--to compare the content of a specific social or cultural tradition of a given society with the content of a specific tradition of another society. It is difficult, for example, to compare the French bourgeoisie of the middle-eighteenth century with the American middle classes of the twentieth century for many reasons--the commercial and industrial base of the two classes differ; they are lodged in quite different stratificational contexts (the French bourgeoisie in an elitist system with an established, if weakening nobility; the American middle classes in an open, middle-class dominated egalitarian system). Still more difficulties arise when culturally more remote social groupings--for example, traditional Indian Brahmins and the New England "Brahmins"--are compared.

One way of overcoming these problems is to refrain from comparing the relevant social groups in terms of content, but rather to compare them with respect to certain intra-societal relations experienced by each, independent of the content of the traditions affecting the group. For example, a number of historical investigations have revealed that one of the burdens carried by the French bourgeoisie in the mid-eighteenth century was what is currently termed "status disequilibrium" or "lack of status crystallization." The middle classes, having attained much in terms of wealth and education, were held back from anything like full social participation with respect to political responsibility, accession to privileges and offices reserved for the nobility, and "high society."[67] These investigations reveal, moreover, that the discomfort created by these status discrepancies was an important determinant of the political alienation of the French middle classes. Now

[67] For example, Alexis de Tocqueville, The Old Regime and the Revolution (New York: Harper & Brothers, 1856); H. A. Taine, The Ancient Regime (New York: Peter Smith, 1931); Elinor G. Barber, The Bourgeoisie in 18th Century France (Princeton: Princeton University Press, 1955), Chapters VI, VII.

compare the American middle classes on this dimension. Surely the American middle classes--however we choose to define them--do not, as a whole, experience the same status discrepancies as were evident in eighteenth-century France. Yet in the American middle classes identifiable subgroups do experience lack of status crystallization--highly educated persons have low-paying jobs; members of underprivileged ethnic minorities have high-status occupations, and so on. Can these subgroupings be compared with the French bourgeoisie? With respect to the content of cultural traditions and aspirations, the answer must certainly be negative. But with respect to their relation to the various hierarchies that make up the stratification systems of the societies, the groupings are readily comparable. They are comparable, moreover, because the basis of comparison is on common intra-societal relations (in this case relations to the stratification system) rather than on the unique cultural and social traditions of the groupings.

Another example will show the advantage of analyzing relations rather than content in comparative studies. Let us suppose we are investigating student unrest in the United States and in Latin America. Let us suppose further that the curriculum studied--law, medicine, liberal arts, etc.--is an important determinant of the level of student political unrest in both areas. But in focusing on this determinant, we immediately raise a number of problems of comparability. How is it possible, for example, to compare law students in the United States with law students in Latin America? Their courses of studies are different in content; American law schools have a "vocational" emphasis, Latin American law faculties a "humanistic" emphasis. The same types of contrasts might be made for other curricula as well. It is possible to transcend these difficulties of comparison, however, by asking, instead, in what relation each curriculum stands to the occupational structure--in terms of ease of entry--of the country in question. In so doing we change the criterion of comparison from the concrete subject matter of the curricula to a relation between student experience and anticipated experience in the occupational structure. And in changing the criterion, we push aside the differences in content between the various curricula. Using the new criterion, we would predict that engineers in both the United States and Latin America would show little unrest as students, because the transition between student training and

adult occupational roles is relatively smooth in both cases; we would predict that American law students, who move into law firms and other forms of practice relatively smoothly, would be less subject to unrest than Latin law students, whose legal training equips them for very few specific occupational positions; and we would predict that liberal arts students in both cases would be subject to high rates of unrest, because in neither case is there a smooth transition to adult roles. By putting the hypotheses in these ways, we by-pass the embarrassing and possibly unmanageable problems of comparing different cultural contents.

Up to this point I have discussed the scientific method, particularly the comparative method, in general terms. I have given only passing reference to post-attack society. This discussion, however, though couched in general terms contains the very issues that arise in developing such knowledge. I turn now to the specific applications of the scientific method to the effects and patterns of recovery from nuclear at[illegible]

II. The Application of the Scientific Method to the Analysis of Post-Attack Society

The Ingredients of the Post-Attack Situation: Dependent and Independent Variables, Parameters and Operative Variables. First let us characterize the post-attack situation in the general terms of scientific inquiry. The dependent variables--the phenomena we wish to explain--can be broken down, for purposes of a preliminary classification, into short-term and long-term consequences of a nuclear attack. Among the short-term consequences are various psychological effects (including bereavement and all its complications, depression, anxiety, hostility, psychosomatic disorders, and so on); trial-and-error, dazed, or immobile behavior; rumor; panic; heroic rescue and relief behavior; hostile outbust and scapegoating; criminal and other deviant behavior (black-marketeering, looting, murder, cannibalism); conflict among social groups; religious behavior, including the rise of cults;

political behavior, including revolutionary challenges against the surviving government.[68] Among the long-term consequences are the relative rates of recovery of social resources, population, productive capacity, and institutional life in the months and years after attack.[69] In the next section I shall present a relatively formal catalogue of the analytic levels at which these dependent variables lie, thus classifying the types of scientific problems to be posed in analyzing post-attack society.

To generate predictions concerning these dependent variables in post-attack society, it is necessary to arrange various independent and intervening variables into patterns of parameters and operative conditions.[70] What are these independent and intervening variables? It is convenient to arrange them in three broad groupings:

(1) The first set of explanatory variables bearing on behavioral and institutional consequences of nuclear attack are the dimensions of the attack itself.

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[68] Other, even more obvious dependent variables--i. e., consequences of nuclear attack--are the level of death, injury, and destruction of the population and physical resources of the society. Since the focus of this essay is on the social and psychological consequences of nuclear attack, I consider the physical and biological destruction to be among the conditions (independent variables) influencing these social and psychological consequences.

[69] This distinction between short-term and long-term consequences is meant to be a relative one, not to be interpreted in terms of any absolutely fixed periods of time. Theoretically, recovery of social resources and population can begin immediately after attack, and various behavioral consequences at least indirectly attributable to the effects of nuclear attack can occur long after it happens.

[70] Depending on the analytic problem at hand, those phenomena that I have just classified as "dependent" may become "independent." For example, one of the conditions (independent variables) that influences the ability of the government to guide a nation to recovery through adequate mobilization, allocation, and investment of resources is the degree to which that government is under attack as being illegitimate. Yet in the discussion immediately concluded, I discussed the rise of challenges to legitimacy only in their significance as dependent variables. This illustration should underscore the assertion, made several different ways throughout the essay, that the status of a variable (independent, intervening, or dependent) is always relative to the scientific problem under consideration.

Most immediately these dimensions include the size of the attack, the targeting pattern (e. g., whether directed at military targets primarily, population centers primarily, or some pattern of both), projected fire effects, projected fallout patterns, and so on. But in order to explain the social and psychological effects of a blast, it is necessary to take account not only of the physical dimensions of the blast, but also to arrive at some estimation of the direct and indirect effects on the population and resource base. Some of these effects can be calculated more or less directly from the size of the attack; for example, an impact of so many thousand megatons may be expected to kill so many million people, injure so many million more, and destroy a certain percentage of residences and other buildings.[71] In addition, the effects of the blast will ramify through the fabric of society and create new problems for the surviving population. A simple example of these ramifying effects is the following: as a result of one possible form of nuclear attack, the greater part of the society's petroleum reserves will likely be destroyed; this in turn will create transportation crises, even if railway depots, tracks, and rolling stocks are not destroyed; and these transportation crises will in turn generate local food shortages and perhaps famine conditions, thus leading to more deaths than would be caused by the direct effects of blast, fire, and fallout.

Another example of the difference between direct effects and ramifying consequences is seen in the efforts of the United States Strategic Bombing Survey to assess the economic effects of bombing on the Japanese urban economy. For

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[71] For examples of such direct estimates, see United States Congress, Joint Committee on Atomic Energy, Biological and Environmental Effects of Nuclear War (Washington, D. C.: U. S. Government Printing Office, 1961); National Resource Evaluation Center, Exercise Spadefork: Situation Analysis (Washington, D. C.: 1963); United States House of Representatives, Civil Defense--1962. Hearings before a Subcommittee of the Committee on Government Operations. Part I. Testimony of Witnesses (Washington, D. C.: U. S. Government Printing Office, 1962), pp. 303-330; Norman A. Hanunian, "The Relation of U. S. Fallout Casualties to U. S. and Soviet Options" (Statement presented to the Military Operations Subcommittee of the Committee on Government Operations of the House of Representatives, Aug. 8, 1961) (Santa Monica, Calif.: The RAND Corporation, 1961); H. L. Dixon, D. G. Haney, and P. S. Jones, A System Analysis of the Effects of Nuclear Attack on Railroad Transportation in the Continental United States (Stanford: Stanford Research Institute, 1960).

purposes of analysis, the investigators isolated three factors that led to the decline of urban production in 1944-45: "(a) direct effects of bombing to productive plant and equipment, (b) the indirect effects of bombing (absenteeism, dispersal, disruption of supply lines, etc.) and (c) general economic conditions (raw material shortages, deterioration of equipment, food shortages, etc.)."[72] Their subsequent calculations indicated some twenty-nine per cent of the total aggregate loss of productive capacity was due to the direct effects, thirty-nine per cent to the indirect effects, and thirty-two per cent to general economic conditions.[73] In another study, the USSBS attempted to show the ramifying effects of bombing on morale. In terms of direct effects, the investigators concluded that "residents of the most heavily bombed cities in general show lower morale than residents of unbombed and lightly bombed communities."[74] In addition, the investigators mentioned certain "radiations" of the effects of the bombing, such as the following:

> Those of the more than 8,500,000 people who left the heavily bombed cities went to live with their friends and relatives in rural and other urban areas scattered throughout Japan, and told of the terrible destruction caused by bombing. Often their experiences, admittedly bad, were exaggerated in the telling. All of this led to widespread rumors about bombing, over which little control could be exercised by the police and government officials. These rumors reached the ears of almost everyone in Japan.[75]

These ramifications work their way through the society and create a sort of "multiplier effect" that aggravates the direct effects of the attack itself; moreover, these

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[72] United States Strategic Bombing Survey, The Effects of an Air Attack on Japanese Urban Economy: A Summary Report (Washington, D. C.: United States Government Printing Office, 1947), p. 11.

[73] Ibid., p. 12.

[74] United States Strategic Bombing Survey, The Effects of Strategic Bombing on Japanese Morale (Washington, D. C.: United States Government Printing Office, 1947), p. 54.

[75] Ibid., p. 55.

ramifications must be estimated accurately if the investigator of post-attack society is to gain a true picture of the attack itself as an independent variable.[76]

(2) The second set of explanatory variables bearing on behavioral and institutional consequences of nuclear attack concerns the disposition of the society at the time of the attack. The direct and indirect effects of a nuclear blast are conditioned, for example, by the distribution of the population at the time of attack--whether the attack takes place at day or night, whether on a week day or a weekend, whether during commuting hours or not; and so on. Other dispositional factors that are more subtle and less subject to measurement are the social and psychological characteristics of American society at the time of attack--including the level of knowledge people have about warning systems and civil defense measures;[77] the distribution of predispositions to neurotic anxiety in various sectors of the population; and so on.[78] These characteristics of the target population interact with the impact of the attack itself in producing distinctive behavioral and institutional consequences.

(3) The third set of explanatory variables bearing on the behavioral and institutional consequences of nuclear attack concern the more or less deliberate efforts of agencies of social control to influence the behavioral and institutional reactions to attack. With respect to attempts to control short-term consequences, I refer, for example, to the behavior of police in the face of actual or threatened outbursts of hostility, looting, and convergence; the behavior of leaders in shelters; and the ability of community leaders to handle streams of migrants and to prevent hostilities between hosts and evacuees from breaking into the open.

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[76] For a dramatic description of the institutional ramifications of the Halifax explosion of 1919, cf. S. H. Prince, Catastrophe and Social Change, (New York: Columbia University Studies in History, Economics, and Public Law, 1920).

[77] For a report on studies concerning public attitudes and knowledge about civil defense, see Ralph L. Garrett, "Summary of Studies of Public Attitudes Toward and Information about Civil Defense" (Washington, D. C.: Department of Defense, Office of Civil Defense, 1963).

[78] For a general discussion of cultural predispositions and their relations to stress reactions, see William Caudill, "Effects of Social and Cultural Systems to Stress"(New York: Social Science Research Council, 1958), especially pp. 14-18.

With respect to the long-term consequences, I refer, for example, to the ability of communities to recuperate from the destruction and loss of life; and the ability of the central and local governments to plan and execute programs of relief, rehabilitation, investment, and rebuilding

These three sets of independent and intervening variables not only influence the state of dependent variables in post-attack society; they also influence one another. For instance, the attack itself may destroy many agencies of social control--e.g., municipal governments--and render them ineffective in handling disturbances arising in communities. On the other hand, if these agencies are well-sheltered at the time of attack,[79] their viability after attack will be much greater.

Predictive propositions about post-attack society also rest on the distinction between parameters and operative conditions. To generate these propositions it is necessary to make certain parametric assumptions about certain of the variables--i.e., to "immobilize" these variables by making them parameters--then to investigate the effects of other variables that operate within this framework of assumptions. It is conventional, for example, to posit a certain size and pattern of attack for purposes of analysis, then to trace certain lines of consequences--for instance, the impact on the religious, political, and familial composition of the population;[80] the rate of economic recovery;[81] or perhaps a range of possible or feasible patterns of economic recovery.[82] Certain assumptions are also made

[79]Sheltering as a variable is an instance of the second class of independent conditions--the disposition of the society at the time of attack.

[80]David M. Heer, After Nuclear Attack: A Demographic Inquiry (New York: Frederick A. Praeger, 1965).

[81]For example, Herman Kahn, On Thermonuclear War (Princeton, N.J.: Princeton University Press, 1960), pp. 78ff.

[82]For example, Sidney Winter characterized his research strategy as follows: "No predictions are made of the course of economic events after a thermonuclear war; instead a range of situations is considered and that range is discussed in terms of the limits of production, rather than in terms of the actual outcomes given particular organizational arrangements." Sidney G. Winter, Jr., Economic Viability after Thermonuclear War: The Limits of Feasible Production (Santa Monica, Calif.: The RAND Corporation, RM-3436-PR, September, 1963), p. 111. See Chapter IV above.

about the state of society at the time of attack; and these assumptions are informed by reference to empirical data that are available on the United States.[83] The task of generating predictions is also sometimes simplified by explicitly refraining from including certain classes of variables in the analysis. In his research on the limits of feasible production, Winter concentrates explicitly on the technological variables, and rules out consideration of other variables:

> The highly important questions of economic organization (including the psychological, institutional, social, and political context of economic activity) are not considered, nor are those aspects of the strategic situation, present or future, that determine the magnitude and pattern of destruction that might reasonably be expected to occur in the United States in the event of a thermonuclear war.[84]

These operations make potentially operative variables into parameters. Once this parametric framework is established, it is possible to generate propositions and models using other variables that are assumed to be operative. Winter, for example, built a simple model for achieving economic viability based on variables such as labor, productive capacity, food inventories, and rates of depreciation.[85] Which variables are considered parameters and which operative will vary according to the explanatory problem at hand. Furthermore, within any given model, each of the parameters may be made to vary to trace the consequences of different patterns of variables. Winter, again, after developing the range of possible outcomes within his model for achieving economic viability, considered

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[83] For example, Dixon, et al., used as one basis for predicting the consequences of nuclear attack a "preattack inventory" which served to characterize the disposition of the target. A System Analysis of the Effects of Nuclear Attack on Railroad Transportation in the Continental United States, op. cit., Chapter III.

[84] Economic Viability after Thermonuclear War, op. cit., p. iii. This formulation is very similar to the economists' traditional treatment of non-economic variables as given or non-operative. It is an example of the method of heuristic assumption. Above, pp. 29-31.

[85] Ibid., pp. 17-24.

the consequences if he varied his assumptions about the size and pattern of the nuclear onslaught.[86] In fact, the various parametric assumptions should sooner or later be systematically relaxed if the model of post-attack behavior and recovery is to be made as comprehensive as possible.

The analysis of post-attack society poses two especially delicate problems with respect to the relations between parameters and operative variables. (1) Many parametric assumptions about the dimensions of nuclear attack and the disposition of society at the time of attack must be continuously revised in the light of the changing technology of nuclear warfare and the defenses against it. For example, before the development of submarines capable of firing missiles with nuclear warheads, the assumption that nuclear war would take the form of one massive attack, without repeated onslaughts, was a reasonable assumption. After the development of this weapons system, however, the possibilities of escalation are much greater, and the single-attack assumption becomes correspondingly less serviceable. Again, two decades ago it was reasonable to assume that the American civilian population was, for all intents and purposes, unprotected against nuclear attack. To some degree this assumption is still appropriate, but it becomes progressively less so as public knowledge and sheltering facilities increase. (2) One of the peculiar--and alarming--features of modern nuclear war is that in certain instances one variable may "overwhelm" all others that otherwise might be operative in post-attack society. For example, given present technology and present sheltering capacity, any person suffering blast effects from a nearby hit is influenced by one crucial variable--a titanic physical force that will kill him instantly. His psychological vulnerabilities to anxiety, his institutional memberships, and other social and psychological variables are obviously irrelevant. To take another example, one by-product of widespread fallout might be the contamination of the total water supply of a region, so that the death of the entire population in that region within a few days becomes a real threat. In this case as well, other possibly operative variables are overwhelmed. The investigator of

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[86] Ibid., pp. 153 ff.

the social and psychological consequences of nuclear attack must be alerted--in so far as the knowledge of the physical and biological effects is adequate--to the occasions on which this overwhelming effect occurs, and with respect to what variables.

Comparing Other Social Situations with Post-Attack Society. Up to this point I have considered the organization of variables with respect to the post-attack situation alone. For this situation, the values of the dependent variables are empirically unknown (as contrasted with some historical situations, in which the outcome has been recorded). The independent and intervening variables can be assigned values on the basis of what is known about the destructive potential of nuclear weapons and the disposition of American society at the present time. The basic method I have suggested for combining variables into hypotheses and models has been the method of heuristic assumption, as applied to a single clinical case (the case being post-attack society). While such combinations may make logical sense, and while definite projections and predictions may be generated, I have not considered the ways in which the empirical adequacy of these hypotheses and models might be put to the test. I have not asked why it might be more advisable, on empirical grounds, to prefer one hypothesis or model over another. To attack these issues, it is necessary to bring forth knowledge based on other situations that resemble nuclear attack and recovery in one or more important aspects. The central task to be faced in the remainder of this essay is to examine the methods--particularly the combination of the comparative method and the method of heuristic assumption--by which the knowledge of related situations can be made to yield maximum confidence in assertions concerning post-attack society.

To put these issues in the language of scientific inquiry: The post-attack situation parallels the experimental situation, outcomes of which are explained by reference to combinations of independent and intervening variables. The "other situations"--conventional bombings, the Japanese experience with atomic attack, disasters, situations of prolonged social isolation, simulated stress in experimental settings, and so on--parallel control groups which have some but not all

features in common with the post-attack situation.[87] It is possible, moreover, to treat characteristics in which these other situations resemble post-attack society as parameters, i. e., as invariant conditions; it is possible to treat characteristics in which these other situations differ from post-attack society as operative variables. Finally, in comparing other situations with post-attack society, it is possible to use both positive and negative comparative methods. The positive method identifies similarities of outcome and associates these with similarities with respect to independent variables; the negative comparative method identifies differences in outcome and associates these with differences with respect to independent variables. By extensive and complicated manipulation of these similarities and differences--both between other situations and post-attack society and among the other situations--it is possible to generate comparative knowledge about the social consequences of nuclear attack.

Before proceeding to a detailed examination of inferences about post-attack society that may be drawn from research on related situations, I shall review briefly some of the problems of comparative analysis--discussed earlier in general terms--as they apply to the study of post-attack society:

(1) The investigator of post-attack society is very restricted in the ways he can isolate and control operative variables.[88] With respect to the post-attack situation itself, it is impossible to achieve empirical isolation, control, and study of these variables, since this situation is empirically non-existent; any picture of

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[87] The parallel is only a formal one. The methodological difficulties involved in achieving control over variables in the "other situations" are notoriously great. Only the most remote approximations to experimental rigor are usually possible. For discussions of these methodological shortcomings of disaster studies, see Lewis M. Killian, An Introduction to Methodological Problems of Field Studies in Disasters (Washington, D. C.: National Academy of Sciences--National Research Council, 1956), pp. 1-10; Raymond W. Mack and George W. Baker, The Occasion Instant: The Structure of Social Responses to Unanticipated Air Raid Warnings (Washington, D. C.: National Academy of Sciences--National Research Council, 1961), pp. ix, 58-59; Allen H. Barton, Social Organization under Stress: A Sociological Review of Disaster Studies (Washington, D. C.: National Academy of Sciences--National Research Council, 1963), pp. 8-12.

[88] This difficulty plagues comparative analysis in any case. Above, pp. 26-27.

this situation has to be based on hypothetical constructions, resting mainly on the method of heuristic assumption. With respect to the "other situations" from which we draw inferences about the validity of models of post-attack society, it has generally proved difficult to control and isolate variables. Disaster research, for example, is especially limited by the fact that "everything happens at once" in such situations, and the different variables must be isolated and studied by only the crudest approximations of experimental manipulation.[89]

(2) The investigator of post-attack society is restricted in the degree to which variables can be quantified effectively.[90] Much of the available data on other, related situations are not often quantifiable. The majority of studies on disasters, for example, are qualitatively descriptive. As for the minority based on quantitative data, " [these data] could be obtained in some cases by careful re-examination of records and statistics kept by government agencies and other organizations; but more often they had to be gathered directly from the population by the researcher, using survey methods."[91] Furthermore, quantifiable data gathered by survey methods after a disaster are likely to be unreliable, since they rest on participants' memories of emotional and confused situations.

(3) All the problems discussed under the heading "The Problem of Comparability"[92] appear in the analysis of post-attack society. Suppose, for example, the investigator wishes to estimate the course of economic recovery of post-attack society in terms of a measure based on a dollar measure of market transactions (for example, gross national income). Suppose further that he wishes to examine other general disaster situations--such as recovery from defeat in a major war--

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[89] See the references listed in footnote 85.

[90] Above, pp. 556-562.

[91] Barton, Social Organization Under Stress, op. cit., p. 8.

[92] Above, pp. 569-583.

as comparative cases to inform his estimates.[93] Such a comparison rests on the assumption that monetary indicators of economic activity in one historical setting--for example, the Japanese economy after World War II--are comparable to estimated monetary indicators in the hypothetical economy of post-attack society. This assumption is open to criticism, since disaster situations typically cause--in different ways and degrees--temporary disorganization of market systems, and give rise to forms of economic activity that are not recorded in monetary terms, such as barter and direct allocation through political means. Therefore, to make monetary comparisons between different disaster situations, or between the contemporary American economy and a hypothetical post-attack economy raises the same problems of comparability discussed earlier in general terms. The same difficulties arise with respect to non-economic variables as well, such as political recovery or the restoration of social integration.[94]

(4) As we have seen, the comparative method suffers from its limited ability to control time and thereby generate causal inferences by examining "before-after" relations.[95] In this respect the analysis of post-attack society possesses a peculiar advantage over other applications of the comparative method. This advantage stems from the fact that it is possible readily to distinguish the "before" from the "after" with respect to one set of independent variables--the attack itself--because of its sudden and dramatic character. If and when nuclear war occurs, the exact time will be tragically evident. Horrifying as this fact is from a human standpoint, it does permit the investigator of the phenomenon to establish with exactness the time at which some of the crucial variables are introduced. In the

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[93] For comparable situations, see Jack Hirshleifer, Disaster and Recovery: A Historical Survey (Santa Monica, Calif.: The RAND Corporation, RM-3097-PR, 1963). Hirshleifer did not actually make these comparisons, though his intention was to bring forth data that could be used for comparative purposes (p. iii).

[94] For a general discussion of the problems that arise in attempting to establish indices of social integration and disorganization, see John F. Cuber, "The Measurement and Significance of Institutional Disorganization," American Journal of Sociology, XLIV, 3 (November, 1938), pp. 408-414.

[95] Above, pp. 562-564.

light of this peculiar advantage, it is perhaps understandable why almost all systematic analysts of post-attack society envision a temporal sequence of phases--pre-attack, warning, impact, and a series of post-attack phases.[96] This particular method of organizing variables is not so fruitful in analyzing historical situations in which independent variables are introduced much more gradually and subtly.[97]

The remainder of the essay will be a more detailed and illustrated examination of the ways in which comparative knowledge may be brought to bear on the analysis of post-attack society. I shall develop this examination by three steps: (1) I shall classify, in a fairly exhaustive way, several levels of comparative analysis; the classification will yield a typology of the kinds of change that are to be expected as a result of nuclear attack and the subsequent efforts at recovery. (2) I shall investigate, in a less exhaustive way, the types of independent and intervening variables that can be brought to bear on changes in these dependent variables. This investigation will be at the same time an evaluation of the ways in which existing theory and research can and cannot be used in the analysis of post-attack society. (3) I shall discuss, even less exhaustively, the ways in which the relations among the independent, intervening, and dependent variables can be refined and combined into models and theories of post-attack societal recovery.

III. Types of Comparative Analysis in the Study of Nuclear Attack and Recovery

In this section I shall develop a typology of comparative analysis which is appropriate to our understanding of nuclear attack and recovery. This typology

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[96] In outlining the various features of the post-attack situation on which comparative data can be brought to bear, I shall use this notion of a temporal sequence of phases as a way of organizing variables. Below, pp. 608-611. See also Smelser, The Social Dimensions of Nuclear Attack, op. cit., pp. 220-222. For a discussion of the methodological status of models based on a sequence of stages, see below, pp. 650-655.

[97] Examples of such historical situations that are less readily analyzable in time-sequence terms are the impact of industrialization on family life, or the impact of religious belief systems on the process of industrialization.

is applicable much more widely in the behavioral sciences--indeed it is quite general--but the illustrations will be restricted mainly to situations of nuclear attack.

The typology will be based on three dimensions: (1) the types of dependent variables that enter the formulation of scientific problems; (2) the number of social units--whether one or more than one--that are involved in the comparative analysis; and (3) the static or dynamic quality of the comparison.

Types of Dependent Variables. In order to pose a scientific question the investigator must operate within a conceptual framework by which the major dependent variables are to be described, classified, and analyzed. Without such a framework he cannot identify ranges of empirical variation that are scientifically problematical. With respect to this characterization of dependent variables I hold an explicitly nominalistic position: that the dependent variables are not in any natural way "given" in social reality, but are the product of a selective identification of aspects of the empirical world of social phenomena by the investigator for purposes of scientific analysis.

With this philosophical position in mind, let me now identify the several levels of dependent variables that constitute the subject-matter of social analysis, with special reference to the situation of nuclear attack and recovery.

(1) Variations in aggregated attributes of the population of a social unit.[98] This is what Lazarsfeld and Menzel term "properties of collectivities" which are obtained by performing some mathematical operation upon some property of each single member.[99] The mathematical operation may be adding, percentaging, averaging, and so on. Examples of aggregated attributes of a population are

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[98] For purposes of the discussion that follows I do not have any particular kind of social unit in mind. The discussion could apply to national units, social classes, communities, formal organizations, or families.

[99] Paul F. Lazarsfeld and Herbert Menzel, "On the Relation between Individual and Collective Properties," in Amitai Etzioni (ed.), Complex Organizations: A Sociological Reader (New York: Holt, Rinehart, and Winston, 1961), p. 427. Lazarsfeld and Menzel use the term "analytical" to describe these kinds of properties, but I would prefer to avoid the use of such a very general scientific term for this specific descriptive purpose

proportions of persons of different ages, proportions of persons subscribing to different religious beliefs, and so on. To pose scientific questions about these attributes is to ask under what conditions variations in them may be expected. Sample questions to be asked in connection with post-attack society are: What would be the consequences of a nuclear attack of a given size and pattern with respect to the proportion of the population killed? Made homeless? Bereaved? What would be the effect on the age composition of the population? The religious composition? The skill composition? Under what conditions could the population be restored to half its pre-attack size? To its full educational level?

(2) Variations in rates of behavioral precipitates in a population over time. Here I refer to variations in rates of voting, religious attendance, crime, suicide, collective protest, and so on. While at this level, like the first, the investigator deals with the properties of individual members of the social unit, he conceptualizes these properties as a flow of behavioral precipitates within a specified period of time rather than a stock of attributes that may be said to characterize a population at a given point in time. The difference may be illustrated by the following example: To enumerate the proportion of Ph. D. 's in a population is to identify an aggregated population attribute; to calculate the proportion of graduate students attaining Ph. D. 's in 1964 is to identify a rate of behavioral precipitates.[100] The following questions constitute scientific problems with respect to variations in rates of behavioral precipitates in post-attack society: What will be the consequences of a nuclear attack of a given size and pattern for rates of deviant behavior of different sorts (looting, criminal activity, etc.)? Under what conditions may we expect a steady rate of investment between ten and fifteen per cent in the three decades following nuclear attack?

(3) Variations in patterned social interaction (social structure). This variable is similar to what Lazarsfeld and Menzel refer to as "structural properties"

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[100] Just as a stock is a resultant of past flows, so in many cases the aggregated population attributes (e. g., proportion of Ph. D. 's) is a resultant of past rates of behavior (e. g., incidence of attainment of Ph. D. 's). Or, to put the point in the language of the Parsonian pattern variables, accumulated past performances (achievements) often become qualities (ascribed characteristics).

of collectives--those properties "which are obtained by performing some operation on data about the relations of each member to some or all of the others."[101] In one sense the notion of social structure is very close to the first two types of variables, since social structure is often operationalized by referring to regularities in the population's attributes and behavioral precipitates. In using the term, "family structure," for example, we refer to the empirical facts that the same people--adult male categorized as husband and father, adult female categorized as wife and mother, and several young classified as son, daughter, brother, and sister--regularly sleep under the same roof, share economic goods, and otherwise behave in repetitive ways. The difference between regularities in a population's attributes and behavioral precipitates on the one hand, and its social-structural arrangements on the other, lies in the ways the notions are conceptualized. Social structure, unlike the other two, is conceptualized on the basis of relational aspects among members of a social unit, not on some aggregated version of attributes or behavior of the individual members.[102] Furthermore, in characterizing social structure, I assume that the relations among members are not merely fortuitous, but are regulated by the operation of certain social forces. These forces are, first, sanctions, including both rewards and deprivations, and, second, norms, or standards of conduct that indicate the occasions on which various kinds of sanctions are applied.[103] To pose scientific questions about social structure is to ask

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[101] "On the Relation between Individual and Collective Properties," op. cit., p. 428.

[102] Because of this fundamental difference between statistical regularities among individuals and social structure, I must disagree with Leach when he characterizes social structure as follows: "The social structure which I talk about... is, in principle, a statistical notion; it is a social fact in the same sense as a suicide rate is a social fact. It is a by-product of the sum of many individual human actions, of which the participants are neither wholly conscious nor wholly unaware." E. R. Leach, Pul Eliya: A Village in Ceylon: A Study of Land Tenure and Kinship (Cambridge: at the University Press, 1961), p. 300. Leach here seems to be ruling out all transindividual, relational characterizations of social action.

[103] Here again I cannot agree with Leach when he says that "[social structure] is normal rather than normative." Ibid.

under what conditions variations in the patterns of norms, sanctions, and regulated interactions may be expected. With respect to nuclear attack and recovery, the major questions concern the ways in which family structure, religious structure, political structure, etc., are vulnerable to attack, and the ways in which these structures may be expected to evolve during the various time-periods after attack.

(4) Variations in cultural patterns. Cultural patterns--values, cosmologies, knowledge, expressive symbols, etc.--supply systems of meaning and legitimacy for patterned social interaction. Examples of concrete cultural patterns are the Judaic-Christian religious heritage, the values of democratic constitutional government, the Baroque musical style, and so on. Cultural patterns are examples of what Lazarsfeld and Menzel call "global" properties of collectives;[104] they are not based either on aggregated information about individual members of a social unit or on specific relations among the members. But like the other, more readily operationalizable types of dependent variables, the concept of cultural patterns is a construct used to characterize properties of a social unit, changes in which social scientists are interested in explaining.[105] With respect to our curiosity about the effects of nuclear attack, there is much concern as to whether such an attack would threaten the existing cultural bases of our civilization--including our religious heritage and our political traditions. Though much of our knowledge in this area is speculative, it is nevertheless possible to pose genuine scientific questions concerning the conditions under which cultural patterns will break down, be restored, or otherwise change.

What are the relations among these several types of dependent variables? The question may be posed at both the empirical and the analytic levels. At the empirical level, the variables may influence one another (that is, they may stand as independent variables to one another). For example, suppose that as a result

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[104] "On the Relation between Individual and Collective Properties," op. cit., pp. 428-429.

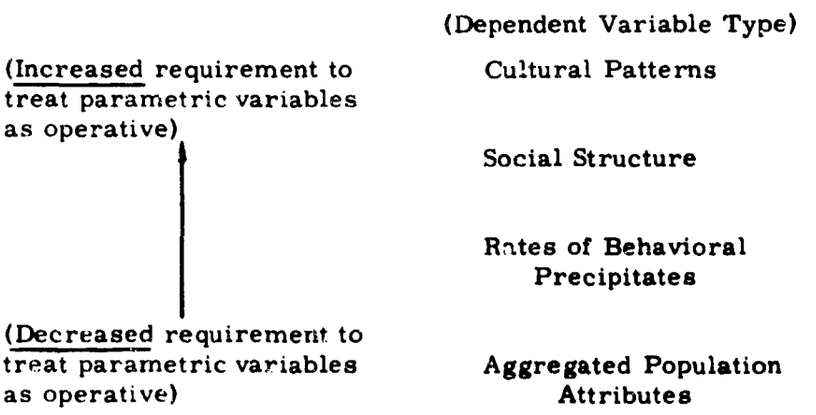
[105] For a brief consideration of a few of the problems that arise in connection with operationalizing global properties such as values, see Neil J. Smelser, Theory of Collective Behavior (New York: The Free Press of Glencoe, 1963), pp. 25-26.

of a nuclear attack, the proportion of widows and orphans in the population increases sharply.[106] This would be a change in aggregated population attributes. Because of this change, however, there might also be an increase in various sorts of behavioral precipitates as well (mourning, deification of the dead, scapegoating, etc.). Furthermore, as a result of these changes, both of which might pose a threat to traditional family life, new, alternative institutional arrangements such as communal institutions for the care of the orphaned may arise to supplement the family. This would constitute a change at the social-structural level. Finally, these combined changes might give rise to disillusionment with older family values, and to a change in the cultural meaning and legitimacy of the family system. This hypothetical causal sequence shows the complicated feedback relations that characterize the several types of dependent variables at the empirical level.

At the analytic level, the several types of dependent variables stand in the hierarchy shown in Figure VI-2.

Figure VI-2

HIERARCHY OF DEPENDENT VARIABLE TYPES IN SOCIAL ANALYSIS



[106] Heer, After Nuclear Attack: A Demographic Inquiry, op. cit., pp. 62-64.

The main feature of this hierarchy--from the standpoint of the methodology of scientific inquiry--is that as we move up the levels more and more variables that have heretofore been treated as parametric now have to be treated as operative variables. This means that scientific inquiry becomes more complex as we move up the hierarchy because it becomes progressively less permissible to ignore the operation of certain conditions or to "freeze" them by parametric assumptions. Let us illustrate this point by a running set of examples:

Beginning with the movement of aggregated population attributes, it is more nearly possible to consider variations in these attributes without reference to variations in motivated behavior, social structure, or cultural patterns. Suppose, for instance, we wish to trace the course of total population size over a period of decades. In the first instance, the movement of this aggregate is a function of birth rates, death rates, and migration rates. Posing the question in this way, it is possible to proceed without making any particular parametric assumptions about the psychological determinants of behavior, the social structure, or cultural patterns. This is possible because the explanation remains at the level of non-behavioral attributes of aggregated members.[107]

Let us now move to the level of behavioral precipitates, considering the fertility rate as an example. At this level it becomes necessary to make, at the very least, some simplifying assumption about the psychological causes of fertility. Suppose, for example, we wish to make a relatively simple hypothesis that size of family is a direct function of income of family. Even this simple hypothesis introduces the psychological assumption that people treat children as economic commodities and that they will have as many children as they can afford. This example shows that when we move to the explanation of behavior it is essential to treat psychological variables as intervening between various kinds of conditions and behavior itself. It is not, however, necessary to consider social-structural and cultural variables as problematic at this level. Analysis of differential fertility

[107] It may be necessary, however, to inquire into some of the psychological, structural, and cultural determinants of some of the variables influencing these movements in order to develop a fuller, more adequate explanatory account.

rates can be performed without reference to family structure itself; or, to choose another example, analysis of differential voting rates can be performed without reference to changes in the legal and constitutional framework within which they occur.

When we move to the social-structural level the problems of considering variables to be parametric become even more complicated. If we are interested in giving an account of the impact of nuclear attack on family structure, it is not legitimate to assume that these changes can be analyzed while holding behavior within this structure constant. Changes in social structure necessarily imply adjustment in the behavioral precipitates from this structure. As we move up the hierarchy, therefore, a certain assymetry among the levels emerges. It is possible to analyze changes at the lower levels without necessarily assuming changes at the higher levels; but analysis of changes at the higher levels necessarily renders problematical the variables at the lower levels. Correspondingly the problem of the manageability of large numbers of variables becomes greater as we move up the hierarchy.

The highest level of analysis involves variations in cultural patterns. At this level, too, the logic of assymetry holds. It is possible to investigate changes in social structure without necessarily making any assertions about changing cultural patterns, but changes in cultural patterns necessarily raise questions as to what is happening at the social-structural and behavioral levels. Because changes at the level of cultural patterns necessarily involve changes in the whole system, these changes cannot be investigated while treating other social variables as parametric. It is for this reason that changes in cultural patterns pose the most complex problems of all the levels of analysis.[108]

The discussion of levels of variables involved in social analysis permits a few observations on two concepts that are used widely in discussions of post-attack society: the concept of "societal vulnerability" and the concept of "societal

[108] For further treatment of the notion of a logical hierarchy among components of social action, see Smelser, op. cit., Chapter II.

recovery." These concepts are not difficult to define in general terms. Vulnerability refers to the degree to which the social and psychological functioning of society is likely to be impaired by a nuclear attack. Sample questions concerning societal vulnerability are: Given the existing pattern of concentration of American industry, in what ways and to what degree is productive capacity likely to be destroyed by a nuclear attack of a given size and pattern? Given the present location of municipal and state government centers, to what degree will governmental functions be impaired by a given type of nuclear attack? Thus the concept "vulnerability" breaks into a number of conditional predictions involving the dimensions of attack as independent variables and various social and psychological variables as dependent. Recovery refers to the restoration or rebuilding, by constructive activity, of the various social and psychological functions.[109]

When we ask how these concepts of vulnerability and recovery can be represented by some concrete indices--or, to put the question differently, what the criteria are for vulnerability and recovery--the question becomes more complicated. Take economic vulnerability as an example. One index of vulnerability could be identified in terms of population characteristics (for example, what would be the likely effect of an attack on per capita economic assets?); another in terms of behavior characteristics (what would be the likely effect on absenteeism and other forms of behavior in the labor market?); another in terms of social structure (what would be the likely effect on the banking and credit structure?); still another in terms of economic values (what would be the likely effect on traditional beliefs in free enterprise?). The same four criteria could be used in posing questions about rates of recovery.

The concepts of vulnerability and recovery also refer to sectors of society other than the economy. Criteria for political recovery, for example, might be

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[109] I do not mean to imply that recovery necessarily results in the restoration of an identical, or even similar social and psychological fabric as that in existence before attack. I do not even mean to imply that the survivors' criteria for defining recovery would be the same as those criteria that we, from the vantage-point of pre-attack society, choose to impose on post-attack society. Changes in criteria for recovery are especially likely to occur if nuclear attack gives rise to substantial changes in cultural patterns. See footnote 198, p. 640.

the re-establishment of high rates of voting behavior (behavioral precipitate); or the re-establishment of stabilized relations among the legislative, executive, and judicial branches (social structure). Similar ranges of criteria could be listed for the religious, educational, medical, and other societal sectors.

The indices for societal vulnerability and recovery thus stand in very complex array when cross-classified by societal sector and analytic level of variable. From this array alone, it is evidently impossible to select a single criterion for vulnerability or recovery, since the various indices do not move along identical paths. Suppose, for example, that investment in heavy industry is very great during the first ten years after nuclear attack; by this index the society would be recovering rapidly; but in the same years the body politic may be infested with divisive conflicts, cleavages, and crises of legitimacy, thus indicating a failure to recover in terms of political stability. Only as it becomes possible to establish definite relations among the levels and types of post-attack changes will it be possible to combine the indices and move toward general definitions of societal vulnerability and recovery. Since we do not understand these relations with the present state of knowledge in the social sciences, it is possible to define vulnerability and recovery only in terms of a number of discrete indices.[110]

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[110] What is required to establish some kind of general index of vulnerability or recovery? (1) The first requisite is a logically precise and exhaustive classification of the various aspects, or subsystems, of society. In the present state of the social sciences we normally rely on imprecise, overlapping, and non-exhaustive classifications such as the division of society into its political, economic, religious, legal, familial, etc., aspects. (2) The second requisite is an adequate theory of processes within each societal subsystem, a theory that will produce determinate accounts of the movement of indices--such as gross national product, political stability, literacy, and so on--under various conditions. The theories appropriate to the different subsystems of society are developed to various levels of adequacy in the present state of social-science knowledge. (3) The third requisite is an adequate theory of the relations among the several subsystems of society, so that the implications of various economic processes, for example, for the various other subsystems, and vice-versa, can be specified. Very little systematic theory on these relations is currently available. (4) The fourth requisite is that the theories appropriate to each societal subsystem be thoroughly grounded in methodologically adequate empirical research. Again, the accomplishments of the various social sciences along these lines are very diverse.

These problems of arriving at a general definition of vulnerability and recovery are logically identical to the problems of arriving at general definitions of concepts like "development" or "modernization" in the analysis of social change. Indices of economic development include measures of per capita production, proportions of resources devoted to different industries, and so on; indices of educational development include literacy rates, proportions of persons completing secondary education, and so on. The concept of development as a whole, however, remains indefinite because the relations among the various types and levels of indices remain theoretically and empirically indeterminate.[111]

The Number of Social Units Involved in Comparative Analysis. This second dimension involves the distinction between (a) the scientific explanation of changes in a dependent variable at different times in the same social unit,[112] and (b) the scientific explanation of changes in a dependent variable at different times in different social units. An example of the first type of operation is to compare the rate of growth of the American gross national product during the two decades after attack with its growth during various periods in recent American history. An example of the second type of operation is to estimate the probable incidence of panic in the event of nuclear attack by comparing the hypothetical state of post-attack society with conditions observed in various other cases of heavy, surprise bombings (e. g., the German bombing attacks on cities like Rotterdam and Belgrade in World War II, American atomic attacks on Hiroshima and Nagasaki). The single

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(footnote 110 continued) On the basis of these four requisites it would be possible to develop a number of aggregative indices of vulnerability and recovery, considered as general entities. For a preliminary effort to meet some of the issues raised by the specification of these requisites, see Talcott Parsons and Neil J. Smelser, Economy and Society (Glencoe, Ill.: The Free Press, 1956), Chapter II. Our discussion was not directed to the formation of aggregative indices of long-term social processes, but it is certainly relevant to this problem.

[111] For further development of the parallels between recovery and development, see below, pp. 638-643.

[112] In this case it does not matter which dependent variable--aggregated population attribute, behavioral precipitate, social structure, or cultural pattern--is under consideration.

unit analysis is an example of the case-study method, whereas the multiple-unit analysis is an example of the comparative method.[113] Even though the first kind of analysis poses serious problems of comparability (in what respects is post-attack America the same socio-cultural system as pre-attack America?), the difficulties in analyzing dependent variables within the same social unit over time are presumably not so great as comparing dependent variables that have been produced in different socio-cultural contexts (in what respects is post-attack America comparable to post-war Japan?). The reason for this is that it is more nearly permissible to treat conditions as parameters within the same social unit than it is in different socio-cultural contexts.[114]

The Static or Dynamic Quality of Comparative Analysis. The basic difference between static and dynamic analysis is whether time is introduced into the usual associations between independent and dependent variables. An example of static analysis is to compare the incidence of various crimes in the first six months after nuclear attack with their incidence at some time in pre-attack society, without attempting to explain the course of the movement between the two points in time. Even though static and cross-sectional, the analysis can still be genuinely explanatory; in this example, it would be so if the analyst accounted for the different rates by reference to a number of independent variables influencing the incidence of crimes in each time period--variables such as institutional disorganization, rates of migration, police morale, behavior of welfare agencies, local politics, and so on.

To make this example dynamic, it would be necessary to trace the path of crime rates over time, accounting not only for the different rates at two different times, but also accounting for how they come to move along the path they do. This involves the systematic introduction of independent variables at specified points in time, and, if the analysis is scientifically more ambitious, the development of these combinations of variables into more complicated models of change. Because

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[113] Above, pp. 559-568.

[114] See the general discussion of the problem of comparability above, pp. 569-583.

TABLE VI-1

TYPES OF COMPARATIVE ANALYSIS,
WITH ILLUSTRATIONS FOR THE STUDY OF POST-ATTACK SOCIETY

	Same Social Unit		Different Social Unit	
	Static	Dynamic	Static	Dynamic
Aggregated Population Characteristics	Comparing occupational structure of U. S. population five years after attack with occupational structure immediately before attack.	Predicting the path of occupational composition of U. S. population, by three-month periods, during the five-year period after attack.	Comparing relation between U. S. population in 1960 and 1980 (hypothetical attack, 1965) with relations between Soviet population in 1939 and 1960.	Predicting path of U. S. population recovery in post-attack society on the basis of Soviet and German population rates after World War I and World War II.
Behavioral Precipitates	Comparing anticipated crime rates six months after attack with actual U. S. crime rates in 1960.	Predicting the course--rise and fall--of looting behavior during the two-year period following attack.	Estimating barter and black-market behavior in post-attack society on basis of increased incidence in Germany in late World War II.	Predicting developmental course of scapegoating over time in fallout shelters on basis of behavior in prisoner of war and concentration camps.
Social Structure	Comparing relative strength of central vs. local government in post-attack society five years after attack with central-local-political relations in World War II.	Predicting an initial period of total mobilization by central government in early post-attack society followed by a number of stages of increasing institutional autonomy from central government.	Comparing spontaneous leadership structure in anticipated shelter arrangements by comparing social organization of British bomb shelters in World War II.	Predicting the evolution of the stratification system of post-attack society by comparing it with changes in stratification in post-war and post-revolutionary settings, e. g., French and Russian revolutions, colonial revolutions.
Cultural Patterns	Comparing level of extremist challenges to political legitimacy in pre-attack society with anticipated challenges in post-attack society.	Predicting rise of altruistic, mutual-aid values in immediate post-attack period, followed by step-by-step attrition of these values.	Estimating continued loyalty to President in post-attack society by comparing Japanese citizens' attitudes toward Emperor and German soldier's attitudes toward Hitler at end of World War II.	Predicting course of growth and institutionalization of new religious beliefs in post-attack society by comparison with similar changes following Black Death, potato famine, etc.

dynamic analysis introduces the problem of time, the path of change over time, and the mechanisms by which change over time is fostered, it is more complicated analytically than static analysis.

The three dimensions reviewed in this section, from which we may de rive a typology of comparative analyses, are represented graphically in Table VI-1, p. 607, with a hypothetical research question about post-attack society entered in each cell. The table reveals that as we move downward and to the right, comparative research becomes more complicated and difficult. At the upper left-hand extremes of the table it is more nearly permissible to treat discontinuity in sociocultural context, time, and analytically higher-level variables as parameters. As we move downward and to the right, however, it becomes necessary to surrender this advantage and treat these characteristics as operative variables. Dynamic comparative analysis of cultural changes in different social units is the most complex case of all; each of the features considered to be parametric from the standpoint of other levels of comparative analysis must now be considered as variable.

IV. Comparing Other Situations with Nuclear Attack and Recovery

In this section I shall assess--with ample but not exhaustive illustrations--research on situations comparable in certain respects with hypothetical nuclear attack and recovery, and thereby show how the canons of the comparative method may be brought to bear on the analysis of post-attack society.

For purposes of analysis, I shall divide nuclear attack and recovery into a sequence of phases--warning, impact, shelter, emergence, adjustment, and recovery--indicating some important dependent variables at each phase and some comparable situations that can be brought to bear at each phase. For each comparable situation I shall indicate the similarities and differences between it and post-attack society, and specify the bases for drawing relatively reliable inferences from these other situations. In this section I shall use the subdivision into phases

as an expository device; in the final section I shall examine the methodological significance of dividing the nuclear attack and recovery into phases.[115]

I shall use the phases and variables specified in my earlier paper, The Social Dimensions of Nuclear Attack,[116] treating them on the present occasion from the methodological rather than the substantive point of view. The following phases and variables, then, are important in nuclear attack and recovery:

(1) Warning and attack phase (from 15 minutes to several hours). The main problems in this phase will concern the adequacy of warning systems, and the movement of persons to appropriate shelters.

(2) Impact phase[117] (from the moment of blast to several hours thereafter). The major problems in this phase will concern the immediate behavioral reactions--shocked and dazed responses, adaptive action of various sorts, and so on.

(3) Shelter phase (approximately one month). In areas heavily contaminated by fallout, activity outside the shelters will be impossible, except for specially-equipped work and relief crews. The major psychological and social problems in these areas will concern adjustment to shelter life. In areas that have escaped both destruction and contamination from fallout (presumably thinly-populated, non-strategic parts of the country) the major social problems will be controlling the movement of the populace, handling apprehensions about future attacks, and preparing for the care of injured and the billeting of evacuees.

(4) Emergence phase (extending approximately one to six months after the shelter phase). The major problems in this phase will be allocating and evacuating people; disposing of dead and caring for sick and injured; billeting evacuees; clearing rubble and decontaminating; re-establishing rudimentary distribution systems for critical resources, such as food, water, and fuel; and re-establishing

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[115] Below, pp. 650-655.

[116] Op. cit. Most of the material in the six paragraphs that follow is taken from that paper, pp. 220-222.

[117] For expository purposes I have added this phase to the phases posited in the earlier working paper.

communication networks. The most salient psychological and social problems will be handling the overwhelming emotions of millions of bereaved people; maintaining law and order in the face of black marketeering, looting, and widespread scapegoating (including scapegoating of the agencies of social control themselves); and mobilizing large numbers of survivors for constructive roles in the adjustment process.

(5) Adjustment phase (extending one to five years beyond the emergence phase). The problems of simply rescuing, caring for, and moving people around the society will gradually recede. Nevertheless, the preponderance of human effort will be devoted to mobilizing people to repair and rebuild a society afflicted by great physical, biological, psychological, and social damage. Most activity in this period will be directed and coordinated by political authorities. It is difficult, for instance, to envision how the educational system could be allowed to develop on its own; or how any significant market system--governed by free prices and wages--could function effectively. Furthermore, this phase will enforce a moratorium on the "good things of life"--consumer goods, relaxation, recreation, routine family life, etc. --because of the need to devote resources to restoring the nation's crippled productive capacity. Many social problems will spring from tensions inherent in a period of prolonged political mobilization (especially since this will be imposed on a society with a tradition of relative freedom from central political direction); other problems will spring from the conflict that will emerge as serious social cleavages (e. g., racial, religious) reappear.

(6) Recovery phase (extending several decades after the adjustment phase). During this final phase the society will devote an increasing proportion of its resources to social goals other than recovery from the destructive effects of nuclear attack. This will involve the growth of greater institutional autonomy for those sectors of society--educational, economic, and so on--which will have been under political direction during the adjustment phase. The major social problems during this phase will result from the tensions arising from the movement away from a mobilization-centered society to some kind of pluralistic society. Threats to social and political stability will arise from social movements that advocate different directions of change, and from the cleavages and conflicts that accompany these movements.

It is necessary to qualify this scheme of phases of attack and recovery in several ways. First, the phases should not be conceived as discrete time-periods, each beginning and ending abruptly, and giving way immediately to the next; empirically the phases fuse indistinguishably into one another. The purpose of introducing the definite time-intervals is merely to indicate the approximate time periods during which certain variables become salient.

Second, the version of the phases I have set forth is not necessarily definitive. Other versions of phases of nuclear attack and recovery are available in the literature;[118] and for certain purposes each phase can be subdivided into several sub-phases.[119]

Third, it is difficult to separate the substantive from the methodological aspects of the several phases. It is evident that to specify the sorts of variables that are important in each phase is to make a rough substantive prediction about the range of consequences of nuclear attack; correspondingly, the comparable "other situations" that are chosen to throw light on each phase are selected with these substantive variables in mind. For this reason the substantive preoccupations of the investigator dictate the types of comparable situations he chooses to analyze. No matter what phases, variables, and other situations are chosen, however, the same canons for comparative analysis, reviewed in general terms above, still hold.

With these qualifications in mind, let us now analyze how the comparative method can be employed at each phase:

The Warning Phase. It will be recalled that the experimental method--and its approximation, the comparative method--rests on the relations among four

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[118] For example, Peter G. Nordlie and Robert D. Popper, Social Phenomena in a Post-nuclear Attack Situation: Synopses of Likely Social Effects of the Physical Damage (Arlington, Va.: Human Sciences Research, Inc., 1961), pp. 3-5; Barton, Social Organization under Stress, op. cit., p. 14.

[119] Mack and Baker, for instance, divide the warning phase into the following sub-phases: "(1) A perceived threat; (2) the sending of signals to individuals, groups or social categories...; (3) the receipt of the signal; (4) interpretation of it; and (b) action based upon it." The Occasion Instant, op. cit., p. 4.

different kinds of variables; these are the independent and dependent variables of the experimental situation and the independent and dependent variables of the control situation, represented schematically in Figure VI-3:

Figure VI-3

SITUATION	VARIABLE: Independent	VARIABLE: Dependent
Experimental	X	Y
Control	X'	Y'

Ideally, the experimental and control situations should be identical with respect to all independent variables except one, so that changes in this one variable can be traced definitively to the differences between the dependent variables Y and Y'.[120]

In comparing the warning situation for nuclear attack with other, related warning situations, the nuclear-attack situation approximates the experimental situation, whereas the other situations approximate control situations.[121] In making comparisons, then, it is necessary to make specifications for four types of variables:

(1) It is necessary to specify dependent variables that are to be accounted for in the nuclear attack situation (Y). In the warning phase, two classes of behavior are of significance: (a) The ways in which the warning signal is interpreted by the populace. Will people know what the warning signal means? In what ways will

[120] Above, pp. 551-553.

[121] Above, pp. 560-561.

it be interpreted incorrectly? (b) The kinds of behavior that will ensue if the warning is perceived and interpreted correctly. Will people panic? Will they move in an orderly way to shelters? Will they seek loved ones? Will they display trial-and-error behavior? Specification of such dependent variables establishes the appropriate scientific questions for the warning phase.[122]

(2) It is necessary to identify other situations, the outcomes of which (Y') are describable in the same language that is applied to the nuclear attack situation. These situations may be natural disasters (hurricanes, floods, earthquakes), bombing attacks, and so on. These situations need not have identical outcomes with the projected warning situation for nuclear attack; indeed, it is by virtue of comparing similar and different outcomes with similar and different independent variables that reliable inferences about nuclear attack can be made.[123] What is essential, however, is a comparative framework so that the outcomes of the two types of situation can be described in the same language.[124]

(3) It is necessary to specify, on the basis of existing and projected knowledge, the independent and intervening variables that will be operative in the nuclear-attack situation (X). These variables include the type of warning system; the degree of public familiarity with the warning for nuclear attack; the amount of time that will ensue between warning and attack; the degree to which the public is aware of this time-interval; the availability of shelters in various communities; public knowledge of and attitudes toward the use of such shelters; and so on. Values assigned to these independent and intervening variables can be gleaned from civil

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[122] Above, pp. 543-544.

[123] Above, pp. 559-560.

[124] For general discussions of the problem of responses to warning, see Charles E. Fritz, "Disaster," in Robert K. Merton and Robert A. Nisbet (eds.), Contemporary Social Problems (New York: Harcourt, Brace & World, 1961), pp. 663 ff.; Irving L. Janis, "Psychological Effects of Warnings," in George W. Baker and Dwight W. Chapman (eds.), Man and Society in Disaster (New York: Basic Books, 1962), especially pp. 67-81.

defense reports on the current degree of preparedness of the civil defense system;[125] surveys of public knowledge of and attitudes about civil defense;[126] and various projections of these variables into the future. Our knowledge of these independent and intervening variables often leaves much to be desired; but it is essential to assign some value to them, at least on the basis of informed assumptions, for we have to know with what hypothetical nuclear attack situation we are going to be bringing other, presumably comparable situations to bear.

(4) It is necessary to specify independent variables from other situations (X') which resemble the nuclear-attack warning situation in some respects and differ from it in others. To approximate control groups precisely, these other situations should resemble the nuclear situation in all respects but one. Because variables in these other situations cannot be readily controlled,[127] however, the investigator has to rely on systematic illustrative examination of the several independent variables to reveal the kinds of responses to be expected in the event of a warning of nuclear attack.

To be at all comparable with the nuclear attack situation, however, the other situations must share a minimum number of important characteristics with the anticipated nuclear attack. For example, from our present knowledge of delivery, detection, and warning systems, the probable time elapsing between warning and nuclear attack would be between 15 minutes and several hours. Disasters with roughly comparable warning times will be most helpful in predicting how people will respond to warnings. Situations with no warning at all--for example,

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[125] For example, Department of Defense, Annual Report of the Office of Civil Defense for the Fiscal Year 1962 (Washington, D. C.: U. S. Government Printing Office, 1962); Office of Civil and Defense Mobilization, Personal Preparedness in the Nuclear Age (Washington, D. C.: U. S. Government Printing Office, 1960).

[126] For example, Garrett, Summary of Studies of Public Attitudes Toward and Information about Civil Defense, op. cit.; Gene N. Levine (ed.), The American Public and the Fallout-Shelter Issue: A Nine-Community Survey (New York: Bureau of Applied Social Research of Columbia University, 1964).

[127] Above, pp. 591-593.

some explosions, the Hiroshima and to some extent the Nagasaki atomic attacks--[128] are not especially helpful, since the warning and impact phases are indistinguishable. Likewise, situations of relatively long advance warning--for example, two days to a week for some floods and storms--are not readily comparable with the nuclear attack situation, since they permit certain independent variables, such as careful planning for evacuation, to play a more significant role in determining behavior than they would in the short anticipated warning-time for nuclear attack.[129]

Having established such points of similarity between other situations and nuclear attack--or having attempted to correct for them by heuristic assumption if they are not precisely comparable--the investigator should then examine the available evidence on these other situations. What, for example, is the influence of institutional and personal preparedness of the public on its adaptive action in the face of crisis?[130] How do persons with severe neurotic anxiety differ in their response to warnings from others, and if so, in what ways?[131] Do differences in cultural

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[128]Stanford Research Institute, Social Organization, Behavior, and Morale under Stress of Bombing (Stanford: Stanford Research Institute, 1953), Vol. I, pp. 12-13; Donald N. Michael, "Civilian Behavior under Atomic Bombardment," The Bulletin of the Atomic Scientists, XI, 5 (May, 1955), p. 173.

[129]See, for example, the role of family structure, educational background, etc., that played a significant role in planning for evacuation in the face of Hurricane Carla in 1961, for which the warning time was two days or more. Harry Estil Moore, Frederic L. Bates, Marvin V. Layman, and Vernon J. Parenton, Before the Wind: A Study of the Response to Hurricane Carla (Washington, D. C.: National Academy of Sciences--National Research Council, 1963), pp. 54-59. For an account of the importance of forewarning time as a determinant of social interaction immediately prior to impact, precautionary or protective action, and loss of life and property, see Charles E. Fritz and Eli S. Marks, "The NORC Studies of Human Behavior in Disaster," Journal of Social Issues, X, 3 (1954), pp. 35-36.

[130]On the importance of public unpreparedness for floods, cf. J. E. Ellemers, General Conclusions. Studies in Holland Flood Disaster Volume IV (Amsterdam: Instituut voor Sociaal Onderzoek van het Nederlandse Volk and Washington, D. C.: Committee on Disaster Studies of the National Academy of Sciences--National Research Council, 1955), pp. 9-18.

[131]See, for example, Martha Wolfenstein, Disaster: A Psychological Essay (Glencoe, Ill.: The Free Press and the Falcon's Wing Press, 1957), pp. 7-8, 37-38.

traditions influence the kinds of adaptive and maladaptive actions taken by individuals under threat?[132] If situations comparable with nuclear attack display differences with respect to these several independent variables, it becomes more nearly possible to draw inferences as to the relative influence of these variables in the event of nuclear attack.

A fine example of the use of the comparative method to isolate and assess the operation of variables in the warning phase is found in the work of Mack and Baker,[133] who compared public reactions to three "false alarm" warnings of air attack in the 1950's.[134] Mack and Baker first noted the common characteristics of all three false alarm situations: "A siren was sounded. The siren was the warning signal for an enemy air attack. In no case did the public hearing the signal receive either beforehand or simultaneously any official countervailing message suggesting that the siren did not 'mean what it said'."[135] These common characteristics, incidentally, are similar to the anticipated characteristics of an actual nuclear attack. The three false-alarm situations differed from one another, however, in other respects. With respect to the time of day, the Oakland warning was in the

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[132] An excellent study of the role of cultural values in response to disaster is found in Clifford's research on two towns--Piedras Negras, Mexico, and Eagle Pass, Texas--which suffered from the same flood of the Rio Grande in June, 1954. Clifford attempted to trace the different behavioral consequences of the relatively "Gemeinschaft" tradition of the Texas town. Roy A. Clifford, The Rio Grande Flood: A Comparative Study of Border Communities in Disaster, (Washington, D. C.: National Academy of Sciences--National Research Council, 1956).

[133] The Occasion Instant, op. cit.

[134] The three studies include William A. Scott's analysis of the surprise defense alert in Oakland, Calif., in 1955, in which 146 persons were interviewed after a false air raid warning; Baker's study of responses to a false air raid warning in Washington, D. C., in 1958, with qusstionnaires from 1,691 federal employees and with 218 interviews; and the study of Katz, et al., of the surprise sounding of Chicago's ari raid sirens in 1959, based on 241 interviews, with many interview questions similar to those in the Washington study.

[135] The Occasion Instant, op. cit., p. 35.

morning, the Washington warning in the afternoon, and the Chicago warning at night. With respect to role location, the Oakland warning found husbands at work and wives at home, the Washington warning reached office workers away from their families, and the Chicago warning found family and friends together.[136] The findings of this study are not particularly striking, since only three false-alarm warnings were studied, and since so many other variables than time of day and role location influenced people's reactions to the warnings; nevertheless, from the standpoint of the method of comparative analysis, the work of Mack and Baker constitutes a model study.

The Impact Phase. The difficulties of comparing nuclear attack and other situations are dramatically illustrated in the period of immediate impact, because a nuclear onslaught would produce an impact of such destructive proportions. Consider, for example, the limited comparability of the following situations:

(1) Some storms and explosions have been as sudden in impact as an anticipated nuclear attack, but the former present a far less destructive onslaught than nuclear attack (except for the point of immediate impact), and a much more limited range of destructive agents (as contrasted with blast, heat, fire, fallout, long-term genetic effects, etc.).

(2) Similarly, some conventional bombings in World War II share some characteristics with nuclear attack; but in general these were of limited magnitude, and with the exception of some surprise bombings--such as the German attacks on Rotterdam and Belgrade--the warning time permitted the target population to protect itself much more effectively than would be possible in the case of nuclear attack.[137]

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[136] Ibid., p. 4.

[137] The Stanford Research Institute concludes in its general survey of bombings that despite complaints and some failures of warning systems in Germany and Japan in World War II, "the air-raid warning systems were apparently well-planned and efficiently operated. The systems used were satisfactory in alerting people to the danger of bombing. Even during saturation bombing there was no general breakdown of the systems." Stanford Research Institute, Social Organization, Behavior, and Morale under Stress of Bombing, op. cit., Vol. 2, p. 85.

(3) Earlier I made the point that with respect to the warning phase the Hiroshima and Nagasaki atomic attacks are not too helpful as comparative cases, since the time-interval between warning and impact was negligible. With respect to impact, however, these situations are the best comparative cases, since the size of the weapons--though tiny when compared to the nuclear devices currently in existence--and the variety of destructive agents come closest to what nuclear attack might now be like. In addition to differences in magnitude of destruction, the Japanese cases differ from the current anticipated case on several counts:

> Cultural differences between Japanese and Americans. . .
>
> The fact that Americans have expectations and conceptions about the bomb which the Japanese did not. . .
>
> The fact that the Japanese were at war whereas the Americans may or may not be. . .
>
> Some degree of civil defense measures against nuclear attack will exist in the event of an attack on the United States, whereas in Japan only defense measures against conventional attack existed.[138]

(4) Some serious plagues and famines have decimated a population to such an extent that the total loss approximates that which might be expected in a nuclear attack. For example, Ireland had a population of just over 8,000,000 in 1841, but in the decade of the plague, it is estimated that between 500,000 and 1,000,000 persons perished and more than 1,500,000 emigrated.[139] The crucial contrast with nuclear war, however, lies in the gradualness of onset. Contemporary nuclear attack could destroy in a few weeks more of a population than the Irish famine took ten years to destroy; therefore the two types of situations are scarcely comparable with respect to impact.

(5) Some wars and revolutions have impaired the productive base of societies as seriously as a massive nuclear attack might do. The index of industrial output in Russia fell from a figure of 109.4 in 1916 (1913 = 100) to 20.4 in

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[138] Nordlie and Popper, Social Phenomena in a Post-nuclear Attack Situation, op. cit., p. 18.

[139] R. Dudley Edwards and T. Desmond Williams (eds.), The Great Famine: Studies in Irish History 1845-52 (New York: New York University Press, 1957), pp. 4, 312, 388.

1920; in these years the Russian nation suffered the ravages of defeat in war with Germany, the internal Bolshevik revolution, and the early years of chaotic experimentation under the Bolshevik regime.[140] Yet this enormous destruction also was relatively gradual in its onset, thereby making this kind of situation only remotely comparable with the expected ravages of nuclear attack from the standpoint of impact.

Nuclear war, then, is "unique in its combination of suddenness of destruction and generalized scale of effect";[141] and--to the detriment of comparative analysis--most comparable sudden disasters are localized in their effect, and most generalized disasters are gradual in their onset. In the face of these limitations on comparability for the impact phase, the investigator has to rely on an imperfect comparative strategy. The essence of this strategy is to choose situations that are comparable to nuclear attack in limited respects, to examine outcomes in these known situations, and to "scale up" these outcomes according to what is known about patterns of nuclear attack. A few examples will illustrate this strategy.

The studies of disasters and bombings--including the atomic attacks on Hiroshima and Nagasaki--have shown uniformly that persons near the center of impact who are not killed or severely wounded respond in typical ways: they suffer numbed shock and disorientation initially; this gives way to a variety of behaviors, including childlike dependency, mutual aid and seeking for family and friends; overt collective panic is seldom observable.[142] Variables influencing the incidence and distribution of these kinds of behavior among survivors are how well informed they were beforehand as to the nature of the impact and how well instructed they

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[140] Hirshleifer, Disaster and Recovery, op. cit., pp. 16-22.

[141] Ibid., p. 2.

[142] J. S. Tyhurst, "Individual Reactions to Community Disaster: The Natural History of Psychiatric Phenomena," American Journal of Psychiatry, CVII, 10 (April, 1951), pp. 766-767; Michael, "Civilian Behavior under Atomic Bombardment," op. cit., p. 174; Fritz, "Disaster," in Merton and Nisbet (eds.), op. cit., pp. 671-676.

were in reacting; how near they were to the point of impact; their degree of exposure to the sight of the dead, dying and injured immediately after impact; and their location relative to loved ones and friends immediately after impact.[143] Given these findings, the next step is to extrapolate from them to a hypothetical nuclear attack. This involves setting up a number of models of impact--varying the assumptions of time of day, distribution of population, size and pattern of atatck--and calculating, on the basis of these models, the proportions of the population that would be separated from their families after impact, exposed to the sight of dead and wounded, exposed to a "near-miss" experience, and so on. By thus inflating or otherwise adjusting the findings from more limited disaster situations, the investigator can gain some knowledge of behavioral responses in the immediate post-impact period of nuclear attack.

A second example concerns the adjustment reactions of children immediately after impact. Research on natural disasters and air raids in World War II suggests that the degree of disturbance of children depends on such variables such as the death or injury of parental figures, separation from parents, and exposure to parental anxiety.[144] To extrapolate from these findings to a hypothetical nuclear attack, the investigator must proceed by several steps: (a) to consolidate and codify the findings on children's disturbances as completely as possible;

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[143] For summary statements of research on these varaibles, see Stanford Research Institute, Social Organization, Behavior, and Morale under Stress of Bombing, op. cit., Vol. 1, pp. 102-106, 117-120; Fritz and Marks, "The NORC Studies of Human Behavior in Disaster," Journal of Social Issues, op. cit., pp. 38-41; Harry Estill Moore, Tornadoes Over Texas: A Study of Waco and San Angelo in Disaster (Austin: University of Texas Press, 1958), pp. 30-31; Moore, et al., Before the Wind, op. cit., pp. 142-143.

[144] Stewart E. Perry, Earle Silber, and Donald A. Bloch, The Child and his Family in Disaster: A Study of the 1953 Vicksburg Tornado (Washington, D. C.: National Academy of Sciences--National Research Council, 1956), pp. 61-62; Helen Swick Perry and Stewart E. Perry, The Schoolhouse Disasters: Family and Community as Determinants of the Child's Response to Disaster (Washington, D. C.: National Academy of Sciences--National Research Council, 1959), pp. 61-63; Stanford Research Institute, Social Organization, Behavior, and Morale under Stress of Bombing, op. cit., Vol. 1, p. 245.

(b) on the basis of current knowledge about nuclear attack, to estimate the numbers of orphaned and otherwise deprived children that will survive an attack;[145] (c) on the basis of these two types of knowledge, to estimate the extent to which emotional disturbance among children will be a problem in the post-impact period.

The Shelter Phase. For purposes of analysis it is convenient to divide the population into that portion remaining in areas that would have to be sheltered for several weeks after attack because of contamination from fallout; and that portion remaining in areas that escape fallout, whose main activity would be to prepare for relief and rehabilitation.

To bring knowledge about situations comparable to shelter life to bear, several steps are essential. First, it is necessary to estimate what shelter conditions would be like in the hypothetical post-attack society--how many persons per shelter, the proportion of sick and wounded, the supply of nutritional and medical supplies, the advance designation of authority, and so on.[146] These estimates cannot be precise, but they can be informed from knowledge about the number of shelters at the current time, the probable size, pattern, and warning-time of the attack, and the advance delegation of responsibility for leadership in shelters through civil defense programs. Second, it is necessary to specify certain variables about which we wish to make predictions--variables such as the level of mental disturbance in shelters, the level of altruistic behavior, the spread of rumors, the possibility of premature emergence, the kinds of conflict, and so on.[147] Third, it is necessary to specify other situations, the outcomes of which are comparable with the possible outcomes of shelter existence.[148] And finally, it is necessary to specify various independent variables that have been observed

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[145] Heer, After Nuclear Attack: A Demographic Inquiry, op. cit., pp. 62-64.

[146] This first class of variables corresponds to the independent variables of the experimental situation (X). Above, pp. 613-614.

[147] These are the dependent variables of the experimental situation (Y). Above, pp. 612-613.

[148] These are the dependent variables of the control situation (Y'). Above, p. 613.

in these other situations, and extrapolate from these situations to the shelter situation.[149]

With these methodological preliminaries in mind, let us identify a number of situations comparable with shelter existence in some respects, and indicate also some of the limitations on making comparisons:

(1) Normally we do not think of famines and plagues as having characteristics in common with anticipated shelter existence. But in at least one particular, some of these situations are comparable. I refer especially to the pattern of illness and death. The Black Plague, for instance, typically took its victims in the following way:

> It must not be inferred that the majority died suddenly, i. e., without warning; those who began with nose-bleeding or blood-spitting might live a day, but not longer. If they were attacked in some other way they might live till the third day, the day on which most deaths occurred; one who lived beyond the third day was likely to die the fifth if he died at all. One who recovered might be attacked again and again, even as many as half a dozen times, and was no more likely to die because of having had the plague before.[150]

This pattern, while not identical with death from radiation fallout, does share with it the period of prolonged uncertainty about symptoms, and the occurrence of death some time after the initial impact of injury.[151] Situations of prolonged uncertainty during illness are particularly disruptive for potential survivors. Careful study of the historical records--diaries, eyewitness accounts, etc.--of such plagues as the Black Death, of individual families subjected to prolonged illness of one member, would provide valuable comparative evidence on the kinds of emotional stress to be expected in shelters, which would undoubtedly have a sizable proportion of exposed sick and dying inhabitants.

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[149] These are the independent variables of the control situation (X'). Above, p. 614.

[150] B. S. Gowen, "Some Aspects of Pestilences and Other Epidemics," The American Journal of Psychology, XVIII, 1 (January, 1907), p. 7.

[151] Fred C. Ikle, The Social Impact of Bomb Destruction (Norman, Okla.: Oklahoma University Press, 1958), pp. 21-22.

(2) The experience in British bomb shelters during World War II, while sharing isolation and overcrowdedness with anticipated nuclear shelter conditions, are by and large not comparable from other standpoints. The British civilian population generally used the underground shelters as dormitories, sleeping there often even in the absence of air raids, leaving the next morning, and resuming normal activities. Because fallout was not a problem in World War II, prolonged isolation was never necessary.[152] On the other hand, certain general phenomena were observed in the British shelters--such as the relation between the rise of spontaneous leadership and high morale--which would probably hold in any shelter situation.[153]

(3) Certain extreme situations--prolonged assignment in polar regions and on radar bases, and prolonged underwater cruises in submarines--share isolation from the outside world with anticipated shelter existence.[154] On the other hand, generalizations about shelter life based on these conditions must be very tentative, because of the obvious differences between them--submarine crews, for example, are likely to have more definite authority patterns than shelter inhabitants; submarine crews are not especially concerned about the life and welfare of their families; and submarine crews are trained and provided with skills for life on a submarine, whereas shelter inhabitants will not be similarly equipped. Despite these differences, certain features of submarine life--the preoccupation with communication with the outside world, the preoccupation with food, the importance of leisure as an antidote to boredom, fatigue, and irritability--are comparable with hypothetical shelter conditions.[155]

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[152]Samuel L. Guskin, "English World War II Bombshelter Experiences and their Application to U. S. Civil Defense Shelter Problems," in Baker and Rohrer (eds.), op. cit., pp. 82-85.

[153]Stanford Research Institute, Social Organization, Behavior, and Morale under Stress of Bombing, op. cit., Vol. 1, p. 114.

[154]See John H. Rohrer, "Implications for Fallout Shelter Living from Studies of Submarine Habitability and Adjustment to Polar Isolation," and Delbert C. Miller, "Some Implications for Shelter Living Based on a Study of Isolated Radar Bases," both in Baker and Rohrer (eds.), op. cit., pp. 22-29, 51-52.

[155]Rohrer, in ibid., pp. 27-28.

(4) Some entrapment situations--e. g., mine disasters, groups stranded during storms--provide vaguely comparable situations with shelter existence. In the study of miners trapped underground for about a week after a mine disaster, investigators identified the emergence of two types of leaders among the miners--those leaders who emerged in the period when the miners were trying to escape, and whose leadership activities centered on overcoming the situational barriers to escape; and leaders who emerged during the period after the miners had more or less given up the idea of escaping, and whose leadership activities centered on the maintenance of morale.[156] While entrapment in a mine differs in many respects from anticipated shelter conditions, this research nevertheless suggests that different types of leadership may emerge during the period of shelter existence. Given the several needs facing shelter inhabitants, the following types of leadership arise: (a) "technical" leadership that would concern testing for radiation from fallout, rationing food and water, determining appropriate moments for emergence, etc.; (b) "medical" leadership that would concern caring for the wounded and dying inhabitants of the shelter; (c) "human" leadership that would deal with the multiplicity of emotional crises and conflicts expected to arise during the period of sheltering. Morale in the shelter would depend in large part on the emergence of leaders in these areas and the coordination among the various leaders.

(5) Some research has been conducted in experimental situations contrived to simulate shelter conditions in various respects.[157] In one of the more carefully conducted experiments, Altman, et al., set up a number of experimental

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[156] H. D. Beach and R. A. Lucas (eds.), Individual and Group Behavior in a Coal Mine Disaster (Washington, D. C.: National Academy of Sciences--National Research Council, 1960), pp. 138-139. The authors drew the parallel between the escape leaders and Bales' instrumental leaders and the survival leaders and Bales' expressive leaders.

[157] A brief general discussion of laboratory simulation may be found in James W. Altman, "Laboratory Research on the Habitability of Public Fallout Shelters," in Baker and Rohrer (eds.), op. cit., pp. 157-166.

groups, varying the factors of temperature, length of stay in shelter, and presence or absence of a trained manager.[158] From this research a number of findings emerged--the tendency for small recreational cliques to develop early and rapidly during the isolation period; the tendency for shelter inhabitants to withdraw from social interaction in the middle part of the isolation period; the tendency for tension and hostile outbursts to increase toward the end of isolation; the tendency for deviance and social control to focus on issues such as the use of foul language and sexual expression. To extrapolate from these laboratory findings to actual anticipated shelter conditions is a questionable exercise, however, since the simulated conditions differ from "the real thing" in many respects. The subjects in the experiments knew the isolation was experimental and knew when they would depart from the shelter; the subjects had experienced no bereavement or property loss, and were not subjected to the sight of dead and injured in the shelters; and, in the experiments conducted by Altman, et al., the subjects not only were generally sympathetic to civil defense measures, but were paid fifty dollars for participating in the experiments.

(6) Biderman has drawn some parallels between temporary prisoner-of-war camps and shelter situations:

> The closest parallel to shelter situations would be the moderate-sized group being held at a temporary camp or collection point, where the captor did not exert active influence on the affairs of his group. Units captured more or less intact would provide a parallel to the neighborhood shelter; a camp including POW's captured in a number of different engagements and largely unknown to one another would approximate the urban-center shelter.[159]

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[158] James W. Altman, et al., Psychological and Social Adjustment in a Simulated Shelter (Washington, D. C.: American Institute for Research, reprinted by the Office of Civil and Defense Mobilization, 1961).

[159] Albert D. Biderman, "The Relevance of Studies of Internment for the Problems of Shelter Habitability," in Baker and Rohrer (eds.), op. cit., p. 40.

Because of the differences in circumstances of entry, age and sex composition, etc., between prisoner-of-war camps and fallout shelters, comparisons between the two must be very tentative. Nevertheless, certain general findings do emerge, such as the tendency for primary groups to form almost immediately after the isolation period begins (as in the simulated shelter experiments), and the tendency for the prisoners to be initially preoccupied with past primary group attachments--"locating friends and finding out about their fate."[160]

(7) Finally, it has been suggested that experiments in which subjects are deprived of sensory stimulation for periods of varying lengths are at least in some respects generalizable to shelter conditions, since the latter may share the conditions of darkness and isolation. It is my impression that very little can be learned from such comparisons, mainly because in some respects--especially intimate social interaction--the shelter inhabitants must be expected to experience a surfeit rather than a deficit of stimulation.[161]

By systematically extrapolating from these various situations, each of which resembles shelter conditions in some respects and differs from them in others, it seems possible to generate quite reliable general inferences as to what conditions may be like in the shelters. The reasons that such inferences are likely to be reliable is that the investigator can readily specify conditions of similarity and difference, since the groups under comparison are isolated physically and of determinate size.

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[160] Ibid., p. 41. In the German concentration camps the prisoners also were preoccupied with past primary group ties during the early period of imprisonment. Bruno Bettelheim, "Individual and Mass Behavior in Extreme Situations," in Eleanor E. Maccoby, Theodore M. Newcomb, and Eugene L. Hartley, Readings in Social Psychology (third edition) (New York: Henry Holt and Company, 1958), pp. 305-306.

[161] For a summary of these and other points of difference between the sensory deprivation experiments and shelter conditions, see Jack A. Vernon, "Generalizations from Sensory Deprivation to Fallout Shelters," in Baker and Rohrer (eds.), op. cit., pp. 64-65.

With respect to establishing knowledge about behavior in areas on the fringes of direct blast and fallout destruction, however, comparisons and inferences are likely to be less precise. The main strategy is to locate situations in which destruction has been localized in some way, and to extrapolate from the behavior of persons on the "fringe" areas of the crisis to what might be expected in a hypothetical post-attack situation. The comparable situations in this case include natural catastrophes such as earthquakes and tornadoes; famines and plagues that decimate urban more than rural areas;[162] and air raids on urban centers. Post-attack society differs radically from these other situations in two respects: (1) Except for a few of the most disastrous plagues and famines,[163] the level of decimation in post-attack society will be unprecedented. (2) In contrast to most comparable disasters, the destroyed areas will be dangerous for several weeks after the attack because of heavy fallout; furthermore, the danger for those in the fringe areas will be unpredictable, since wind conditions can bring fallout into areas that have escaped blast damage and prior fallout. Despite these differences, other disaster situations suggest that the following kinds of behavior might be expected in areas that are unaffected or mildly affected by the blast and subsequent fallout:

(1) Much of the survivors' attention in unaffected areas will be given over to manufacturing rumors which "describe" and "explain" the catastrophe,[164] especially if--as is likely to be the case--authoritative information on the extent of the damage and the likelihood of future attacks is lacking. Almost every past disaster has been followed by a flurry of rumors on the extent of damage, the cause of the disaster, the likelihood of recurrence, and so on.[165]

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[162] See, for example, Gowan, "Some Aspects of Pestilences and other Epidemics," op. cit., pp. 7 ff., for an account of the degree to which urban centers were affected during the Black Plague in Europe.

[162] Ibid.

[164] This statement applies to surviving shelter inhabitants as well.

[165] See, for example, Durganand Sinha, "Behavior in a Catastrophic Situation: A Psychological Study of Reports and Rumors," British Journal of Psychology, XLIII, 3 (August, 1952), pp. 200-209; Wolfenstein, Disaster, op. cit., pp. 151, 163, 189 ff.

(2) Persons in the fringe areas will tend to converge on the impact area, mainly to seek out friends and loved ones, but also to satisfy motives of curiosity, exploitation, and so on.[166] In the Hiroshima and Nagasaki bombings, thousands of persons converged on the scene of destruction during the days following the attacks.[167] It may be argued, however, that if people are aware of the dangers of fallout--which would probably be significant in the few weeks after nuclear attack--the convergence effect would be less. Other situations in which the area of impact is known to be dangerous should therefore be studied; for example, in infectious plagues--such as the Black Death--are primary-group forces that draw persons into the danger area in any way counteracted by the known dangers of entering the stricken area? Historical research on population movements during destructive plagues would throw light on this kind of question.

(3) In localized disasters two forms of relief behavior typically emerge: (a) Spontaneous patterns of mutual aid, rescue, and other adaptive behavior develop among survivors in the stricken area itself. (b) The surrounding areas, undamaged by the disaster, yield a veritable cornucopia of formal and voluntary relief activities on behalf of the local community. Describing this effect in the Worcester tornado, Wallace commented:

> The impact area was blanketed with protective agencies: hundreds of police, firemen, National Guards, public works people, CD volunteers, and miscellaneous helpers invaded [Worcester] during the rescue period; hospitals had more blood donors than they could handle, the Red Cross mobilized hundreds of nurses; equipment and supplies of all kinds were funneled into Worcester from all over the northeast, and four hundred twenty-five trailers came from Missouri.[168]

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[166] The best study of this phenomenon is Charles E. Fritz and J. H. Mathewson, Convergence Behavior in Disasters: A Problem in Social Control (Washington, D. C.: National Academy of Sciences--National Research Council, 1956).

[167] Stanford Research Institute, Social Organization, Behavior and Morale under Stress of Bombing, op. cit., Vol. 1, p. 105.

[168] Anthony F. C. Wallace, Tornado in Worcester. An Exploratory Study of Individual and Community Behavior in an Extreme Situation (Washington, D. C.: National Academy of Sciences--National Research Council, 1956), pp. 155-156.

From what is known about the probable aftermath of nuclear attack--particularly the likelihood of the presence of lethal levels of fallout for several weeks--these two types of relief are not likely to develop on a large scale.[169] Spontaneous rescue behavior in the stricken areas themselves will have to be restricted to within-shelter situations (caring for the wounded, for example); any attempt by survivors to move about the stricken city (for example, to search for and help family members feared lost) will result in debilitating exposure to fallout. Furthermore, entry of outside rescue agencies into the stricken areas will be limited for several reasons. First, because of the extent of damage, the unafflicted portions of the society will simply be overwhelmed with a demand for help; they will not be able to supply relief to more than a tiny proportion of the stricken areas.[170] In addition, because of the presence of heavy fallout, only specially-clothed crews can move into the stricken areas without risking life and health. A spontaneous mass convergence would result in heavy casualties on the part of those moving into the area.[171]

In the light of these points, it is apparent that the interaction between afflicted and unafflicted areas during the first month after nuclear attack will be very restricted. Only that trickle of refugees escaping fallout will begin to appear in the afflicted areas.[172] Those moving into the stricken areas will probably be

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[169] This is not to say that heroic relief and rehabilitation will not occur at all in post-attack society; but its form will be quite different from that observed in past, localized disasters.

[170] One of the reasons why massive aid converged on Worcester, according to Wallace, was that there was an "absence of competition from anywhere nearer than Ohio for emergency supplies and personnel." Tornado in Worcester, op. cit., p. 156. Surely this condition cannot be expected after a nuclear attack of even modest magnitude.

[171] Efforts on the part of authorities to prevent convergence behavior may, however, create additional psychological tension for the survivors. Much disaster research indicates that very severe psychological stress and "disorganized" behavior are generated when survivors do not know about the fate of loved ones and are unable to reach them. Below, pp. 644-645.

[172] After fallout ceases to be an immediate danger, this trickle will likely turn into a flood. Below, pp. 630-632.

limited to crews on specific missions, such as disposing of the dead, clearing rubble, and rebuilding critical facilities such as railway depots and fuel pumps. The probable effectiveness of these organizations can be estimated from past research on organizational activity in disasters, which has shown, for example, that advance specification of organizational goals and means makes for greater effectiveness,[173] and that coordination of organizational jurisdiction is essential to the minimization of conflict among organizations.[174]

The Emergence Phase. These arguments suggest that during the shelter phase, two parts of society--that suffering from substantial blast destruction or prolonged fallout and that part escaping these effects--will be quite isolated from one another. As the dangers of fallout recede and if no second wave of attacks occurs, these two parts of society will re-establish interaction in a number of ways after several weeks have elapsed from the time of impact. The main form of interaction will be that the relatively undamaged areas will have to provide food, shelter, and other forms of welfare--such as it may be--to the flood of refugees that emerges from the shelter areas. In addition, whatever remains of the society will have to be mobilized for an emergency restoration of the rudiments of industry, agriculture, transportation, and communication. And finally, the surviving society will have to be preoccupied with preserving law and order in the face of possible looting, rioting, scapegoating, and various forms of collective protest.

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[173] For an example of the initial chaos that may result when no specific-purpose organizations are available, see the Stanford Research Institute's summary of early conditions in Hiroshima after the atomic attack: "... it was three months after the bombing... that the first streetcar began operating. People still wandered aimlessly about the ruins, and only a few shacks had been built as evidence of reoccupation of the city. No system for collection of night soil or garbage had been instituted. Leaking water pipes were seen all over the city, with no evidence of any attention. It was reported that, following the bombing, several days were required for disposal of the dead, and then they were simply piled into heaps and burned, without attempts at identification or enumeration. Streetcars were burned as a method of cremating the bodies within. All in all, there appeared to be no organization and no initiative." Social Organization, Behavior and Morale under Stress of Bombing, Vol. 2, p. 137.

[174] See Barton, Social Organization under Stress, op. cit., pp. 98-122; Moore, Tornadoes over Texas, op. cit., p. 87; Fritz and Williams, "The Human Being in Disaster," op. cit., p. 47.

In seeking situations comparable with this emergence phase, the investigator may turn to some of those very situations that are of limited comparative value in connection with the earlier phases. We discovered, for example, that with respect to impact little is to be gained from comparing many floods and storms (which are limited in scope and often gradual in impact) with nuclear attack (which is generalized in scope and sudden in impact).[175] The emergence phase, however--and later phases of recovery--create problems of adjustment similar to those created by these natural disasters, despite the great differences in initial impact. This observation underscores the general point, made above,[176] that comparisons between post-attack society and other situations must be highly selective.

With respect to evacuation from sheltered areas in post-attack society, the following generalizations emerge from studies of past large-scale evacuations under crisis conditions:

(1) Initially the relations between the evacuees and the hosts are dominated by the atmosphere of a "therapeutic community"--with near-universal feelings of warmth, intimacy, generosity, and solidarity--but sooner or later this gives way to a period of mutual suspicion, accusation, conflict, and complaints of injustice.[177] This phenomenon has been well documented in the evacuation experiences of World War II and the Dutch floods of 1953.[178] The social and psychological

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[175] Above, pp. 617-619.

[176] Above, pp. 591-595.

[177] This phenomenon appears to be a very generalized response to disaster. See Barton, Social Organization under Stress, op. cit., pp. 123-126, 162-66; also Barton, "The Emergency Social System" in Baker and Chapman (eds.), op. cit., pp. 222-267.

[178] See F. C. Iklé and H. V. Kincaid, Social Aspects of Wartime Evacuation of American Cities (Washington, D. C.: National Academy of Sciences--National Research Council, 1956), pp. 39-52, 94; Titmuss, Problems of Social Policy, op. cit., pp. 113-114; M. Jeanne van Doorn-Janssen, "A Study of Social Disorganization in a Community," in Community Studies. Studies in Holland Flood Disaster 1953. Volume III (Amsterdam: Instituut voor Sociaal Onderzoek van het Nederlandse Volk; and Washington, D. C.: Committee on Disaster Studies of the National Academy of Sciences--National Research Council, 1955), pp. 157-213; United States Strategic Bombing Survey, The Effects of Strategic Bombing on

mechanisms underlying this sequence are not understood completely, but it appears to be sufficiently general that there is no reason to believe that it would not characterize the post-attack relations between hosts and evacuees as well.

(2) A major determinant of evacuee morale is the degree to which their primary group ties are kept intact. Summarizing research findings on the evacuation schemes in Great Britain, Germany, and Japan in World War II, the Stanford Research Institute concluded:

> Parents seem more willing to be separated from their older children than from each other and their younger children; children billeting in areas close to their homes tend to return to their homes more readily than those who are billeted at greater distances; children from the poorer districts of the city are more likely to return to their homes than those from the better-off districts; evacuation to relatives appears more acceptable to evacuees than evacuation to strange hosts. The place of employment, the place of residence, and the presence of family friends and neighbors, provide significant bonds for the evacuated homeless urbanite to his former city.
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> Separation from the family and worry about the welfare of members of the family were the main disadvantages of evacuation. In all three countries they were prominent factors in the return of people to their former homes. Many people preferred to remain near home and accept poorer accommodations and added danger in order to be near their families.[179]

(footnote 178 continued) German Morale, Vol. I (Washington, D. C.: United States Government Printing Office, 1947), pp. 70-72.

[179] Social Organization, Behavior, and Morale under Stress of Bombing, op. cit., Vol. 2, p. 207, also Titmuss, Problems of Social Policy, op. cit., pp. 388-389.

(3) The circumstances of post-attack evacuation will create a great potential for deviant behavior.[180] The heightened emotional state of the population (resulting especially from mass bereavement); the dislocation of large numbers of people through evacuation and migration; the existence of local and perhaps general shortages of vital supplies; and the local and perhaps general breakdown of authority--all these variables known to foster deviance will be combined in the post-attack situation. Consider the following situations, in which only some of these variables have been present. In the siege of Leningrad during World War II, extreme shortages gave rise to black market activities, theft, looting, and even cannibalism.[181] The United States Strategic Bombing Survey reported increases

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[180] The theory of deviance and social control, as developed in sociology and social psychology during the past several decades, is one of the most relevant bodies of theory for the analysis of post-attack society. Deviance as a generic term refers to behavior that in one way or another runs counter to the normative structure of the social system within which the behavior occurs. Examples of behavior that are often considered deviant in the sociological literature are sexual perversions, religious heterodoxy, criminal activity, and addiction to alcohol or drugs. Types of deviant behavior that would be of especial interest to the student of post-attack society would be looting and other criminal activity, attacks on the legitimacy of the surviving government, and the formation of novel and unorthodox religious cults in the wake of attack.

Social control as a generic term refers to those counter-determinants that tend to reduce the incidence of deviant behavior. Social controls are frequently divided into two categories: "preventive," or those that minimize the conditions giving rise to deviant behavior (an example would be slum clearance in the interests of crime prevention); and "responsive," or those controls that are exercised in direct response to the threat or actual occurrence of deviant behavior (an example would be police and court action taken against criminals).

For a sample of the theoretical literature on deviance and social control, see Robert K. Merton, Social Theory and Social Structure, op. cit., Chapters IV and V; Parsons, The Social System, op. cit., Chapter VII; and Albert K. Cohen, "The Study of Social Disorganization and Deviant Behavior," in Robert K. Merton, Leonard Broom, and Leonard S. Cottrell, Jr. (eds.), Sociology Today (New York: Basic Books, 1959), pp. 461-484.

[181] Leon Gouré, The Siege of Leningrad (Stanford: Stanford University Press, 1962), pp. 214-216).

in looting, riots, crime, and black markets, as well as opposition toward the government, near the end of World War II in Germany.[182] And some of the classic famines of history have produced an increased incidence of theft, poaching, and other forms of deviance.[183]

In presenting these illustrative references from situations that are comparable to post-attack society in the emergence phase, I have not attempted to exhaust the problems of this phase. I have said little, for example, about the difficulties in achieving effective coordination between central and local authorities in the direction of restorative activities.[184] Rather than continue with illustrative generalizations, however, I shall conclude this discussion of the emergence phase with a methodological observation.

The reader may have noticed a contrast between the discussion of the emergence phase and the discussion of the earlier phases. In the warning, impact, and shelter phases I attempted to draw out the similarities and differences between nuclear attack and other, comparable crisis situations. I asked, for example, how the length of warning of nuclear attack compared with warning time in various natural catastrophes;[185] how life in fallout shelters compared and contrasted with other types of isolated existence.[186] In discussing the emergence phase, by contrast, I let this preoccupation with the precise similarities and differences between nuclear attack and other types of crises slip into the background. In fact,

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[182] The Effects of Strategic Bombing on German Morale, op. cit., pp. 87-103.

[183] Edwards and Williams (eds.), The Great Famine, op. cit., pp. 401-403; Gowen, "Some Aspects of Pestilences and other Epidemics," op. cit., pp. 11-12.

[184] For a few substantive observations on this problem, see Smelser, The Social Dimensions of Nuclear Attack, op. cit., pp. 247-251.

[185] Above, pp. 614-616.

[186] Above, pp. 622-626.

the only essential point of similarity between post-attack society and other situations that must be established for this phase is that large numbers of persons are required to be billeted, relocated, and rehabilitated as a result of an impact from a severe destructive agent. Additional differences between general disasters and nuclear attack become less pronounced as time elapses after the impact phase, the reason for this is that, as time elapses, many intervening adjustment processes transpire, so that variables such as the precise length of warning time and the suddenness of impact become less determinate in their causal effects than they were in the phases during and immediately following the attack.

This contrast between the early and late phases of the attack-and-recovery sequence yields both advantages and disadvantages to the investigator focusing on the later phases. By way of advantages, he is able to bring a wider range of comparative situations to bear, since those recovery processes that are linked specifically to the impact of nuclear attack itself gradually recede. In the later phase he can base his inferences more on his knowledge of general processes of recovery, regardless of specific impact. By way of disadvantages, however, the investigator becomes relatively less able to make his conditional predictions about reaction-and-adjustment phenomena as specific as he was able to do in the earlier phases.

In the warning phase, for example, the investigator faces the relatively manageable--even if complex--task of assessing the effect of warning on a routinely-functioning society. But if the investigator is attempting to portray the exact state of society several months after attack--its level of disorganization, its rates of deviant behavior, its progress toward recovery--he has to make definite assumptions about how society has moved through <u>all</u> the previous phases of recovery from the impact. As more and more time elapses after impact these kinds of assumptions become more and more artificial (and the predictions correspondingly more and more speculative) because the investigator cannot control what has transpired in all the preceding phases. This reasoning leads to the conclusion that precise conditional predictions become more difficult in the later phases of recovery, and the

investigator has to settle for characterizing broader ranges of possibilities of recovery.[187]

The Adjustment Phase. This phase is assumed to extend from one to five years after the emergence phase. From the standpoint of resources, it is assumed that both human skills and capital can begin to be withdrawn from meeting the immediate crises of rehabilitation and repair, and that the economy can begin to devote more resources to longer-term investment. From the standpoint of institutional structure, it is assumed that the adjustment phase will see the beginnings of the establishment of an independent market system, credit mechanisms, education and training programs, and so on. In short, the adjustment phase will be marked by the transition from extraordinary emergency mobilization of resources to relatively more routine institutionalized social processes. Exactly when such a phase begins depends on the magnitude of the original attack and on the effectiveness with which the society meets the immediate exigencies imposed by the initial destruction.

The most appropriate comparative data for this phase are found in historical situations in which the destruction of resources or population have reached proportions similar to those expected for nuclear war. Such situations would include especially destructive wars (such as the Thirty Years' War and both World Wars), internal revolutionary convulsions (such as the French Revolution and the Bolshevik Revolution), and decimating famines and plagues. Because the recovery processes in this phase involve a period of up to five or six years after impact, the exact nature of the impact can vary considerably and still not affect comparability adversely, as it would in the earlier phases.[188]

The most instructive comparative study for the adjustment phase is Hirshleifer's analysis of recovery following four cataclysmic social upheavals--the initial period of Russian communism between 1918 and 1921, in which the

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[187] For further discussion of conditional predictions, see above, pp. 548-551; also Smelser, "The Social Dimensions of Nuclear Attack," op. cit., pp. 222-223.

[188] Above, pp. 634-635.

society suffered an extraordinary decline in production in the wake of a major defeat in war and a major internal social upheaval; the decline of the American Confederacy during and immediately after the American Civil War; Japan during and after World War II; and Germany during and after World War II.[189] With respect to the decline of production, these historical situations approximated what post-attack society might be; for example, German industrial production in 1946 was about one-quarter of its 1938 level, and Soviet industrial production in 1920 was about one-fifth of its 1913 level.[190] With respect to population loss, however, these national experiences reached only a fraction of the level anticipated under conditions of large-scale nuclear attack.[191]

Hirshleifer concentrated his analysis mainly on economic and political variables; in particular he was interested in the impact of governmental policies on the rate of economic recovery. Basing his conclusions on the four illustrative cases, he concluded:

> . . . whatever the technological impact of an initial disaster upon the productive potentialities of an economy, there is likely to be a characteristic organizational response to the crisis in the form of adoption of monetary-fiscal policies of repressed inflation. At the extremity of the crisis, when the stress is at its utmost effectiveness, it would be hard to say if such a policy really worsens matters. However, in the initial response to the threat the effective use of the society's resources is likely to be impaired by a repressed-inflation policy; and, almost certainly, recovery after cessation of the external pressure will be impaired.[192]

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[189] Disaster and Recovery, op. cit.

[190] Ibid., pp. 20, 89.

[191] Ibid., pp. 121-123.

[192] Ibid., p. 120.

The import of Hirshleifer's argument here is that after a period of centralized mobilization and direct allocation of resources, a judicious policy would be to allow for a relatively greater play of market forces, i.e., for greater institutional autonomy of the economy.

Hirshleifer goes on to make a number of looser speculations on the basis of his four cases--for example, "the catastrophes... seem not to have led directly to as much changer of popular revolt from the rule of the then-established authorities as might have been anticipated."[193] To establish the relative validity of this speculation, more comparative work on historical cases is required. In particular, such a proposition should be informed by historical analyses of revolution and counter-revolution. Furthermore, the investigator would do well to broaden his historical perspective. Many of the variables that are important in explaining the processes of revolution and counter-revolution are to be found in a much broader range of historical situations than the sort of social cataclysm analyzed by Hirshleifer.[194]

The Recovery Phase. In concluding his monograph, Hirshleifer observes that "the subject of disaster and recovery could be regarded as a kind of special case of the general problem of economic development."[195] This statement becomes more applicable as more time elapses from the instant of impact. That is to day, once the processes of immediate rehabilitation and preliminary restoration have been more or less completed, the more will the general principles of long-term economic and social change (and the less the specific consequences of nuclear attack itself) figure in the on-going social processes. We would expect, therefore, that for the decades following the nuclear attack the investigator can

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[193] Ibid., p. 124.

[194] For an examination of the general variables affecting revolutionary and related movements, see Neil J. Smelser, Theory of Collective Behavior (New York: The Free Press of Glencoe, 1963), Chapter X.

[195] Disaster and Recovery, op. cit., p. 124.

profit from general knowledge of economic and social development that is currently accumulating in economics, political science, sociology, and anthropology.

Consider first the long-term recovery process in terms of economic development. With respect to the factors of production, the society will be underdevelcped, because of the massive destruction of natural resources, laborers, inventories and plant, and organizational ability. On the other hand, the factors of production, while much reduced in quantity in post-attack society, will have characteristics unlike other underdeveloped societies. The labor force, for example, will be decimated by nuclear attack by virtue of simple population loss; from the economic standpoint labor will be in short supply. But this will be a unique type of labor shortage. For many underdeveloped areas labor shortage is not a case of numbers of potential laborers but a case of low levels of skill among the potential laboring population. In post-attack society it will be a case of vastly reduced numbers of highly-skilled workers. Furthermore, the laboring population, having been socialized in an industrial society, will not likely be resistant to the discipline of the workplace to the same degree as laboring populations of countries that have not industrialized. On the basis of such considerations the investigator can assign a value to the supply of labor in post-attack society. He can also construct estimates of capital, natural resources, and entrepreneurial ability, basing these estimates in each case on the expected effects of nuclear attack. Having made these estimates, as well as estimates of demands for the factors of production for various projected rates of recovery, the investigator can construct models of economic growth to be applied to post-attack society. Such models would be unique in that the values assigned to the factors of production differ from other models of development, but in logical structure they are identical to general economic models of long-term development.[196] Because of this identity, many of the theoretical models and empirical results of contemporary economic research constitute comparative material that can be brought to bear on the long-term analysis of post-attack society.

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[196] For a review of contemporary models of economic growth, see Henry J. Bruton, "Contemporary Theorizing on Economic Growth," in Bert F. Hoselitz (ed.), Theories of Economic Growth (Glencoe, Ill.: The Free Press, 1960), pp. 239-298.

The analysis of cultural and social-structural changes in post-attack society can also profit from research on development. Consider first the role of cultural values in economic growth. Ever since Weber's monumental work on the relations between Protestantism and rational bourgeois capitalism, many investigators of economic growth have been alerted to the fact that permissive or encouraging cultural values constitute an important precondition for the movement into industrial development. (The values need not be religious; more often than not they have been the values of aggressive nationalism, as in the case of most of the new nations now attempting to move ahead economically).[197] With respect to the growth of post-attack American society, cultural values would appear to be a less problematical variable than they have been in most historical cases of industrialization. Despite the massive destruction caused by a nuclear attack, it would probably not destroy the cultural values of the majority of the survivors;[198] and some of these values are those that encouraged and sustained the development of an advanced industrial civilization for one and one-half centuries. Reasoning thus, and comparing post-attack society with other underdeveloped societies, we may conclude that the cultural preconditions of post-attack American society would be relatively conducive to rapid recovery.

Much can be learned, too, about the processes of long-term social-structural change in post-attack society from the comparative study of structural changes that accompany economic and social development. One of the characteristic features of pre-modern societies is that their social structures are functionally undifferentiated. Economic production, for example, is typically located in kinship units, which either consume their own products or offer them for exchange within a narrow village or tribal context. The whole process of production and

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[197] For a brief characterization of forms that cultural preconditions can take, see W. W. Rostow, The Stages of Economic Growth: A Non-Communist Manifesto (Cambridge: at the University Press, 1960), pp. 26-35.

[198] It should be kept in mind, however, that the destruction of society is also likely to create conditions that may breed disillusionment with and attacks on the legitimacy of the surviving government and the values under which it is institutionalized. Smelser, The Social Dimensions of Nuclear Attack, op. cit., pp. 245-251.

exchange is frequently regulated by religious sanctions. From a social-structural point of view, the economic, kinship, community, and religious are relatively undifferentiated from one another.

As development proceeds, however, these different institutional complexes come to be relatively more differentiated. Production moves to manufacturing establishments that are separate from the households of the producing agents; exchange extends beyond community, even beyond national lines; and distinctively economic sanctions (e. g., prices) begin to develop independently of traditional religious and community sanctions for economic activity. As these lines of differentiation proceed, furthermore, new integrative problems arise. Traditional mechanisms of social regulation--such as extended kinship, tribal chieftainship, and village authority--become archaic as the activities they once regulated grow beyond their spheres of control. Societies are thus faced with the requirement of forming some kind of new integrative structures--such as political units beyond the community level, political parties, trade unions, and so on--or else facing a series of integrative crises. These tensions between differentiation and integration--plus those tensions resulting from the fact that differentiation and integration themselves proceed at different rates in different sectors of society--set the stage for a high level of social strain as development proceeds. This strain, moreover, is an important determinant of various disturbances (political protest, religious ferment, riots, crime, etc.) that societies undergoing rapid development typically experience.[199]

Similar processes of change may be expected in post-attack society, though the characteristics of this society impose distinctive conditions on these processes. In many respects the early stages of recovery from nuclear attack will be characterized by a social structure that is relatively undifferentiated by comparison with the complex social structure of pre-attack industrial society. Consider

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[199] Some of the relations among differentiation, integration, and social disturbances in economic development are spelled out in Neil J. Smelser, The Sociology of Economic Life (Englewood Cliffs, N. J.: Prentice-Hall, 1963), Chapter 5.

the following examples: (1) In the early post-attack stages governmental involvement in the economic, educational, and other institutional spheres will be unquestionably greater than at the present time. Political authorities, for example, will take greater responsibility for economic mobilization and allocation, and free markets and credit mechanisms will play a less significant role. The exact balance between central and local governmental control, and the required duration of stringent governmental regulation are open to considerable variation. Nevertheless, the main point remains that governmental activity and other institutional activities will be closely articulated for a certain period after attack. (2) The therapeutic community--a highly diffuse, unspecialized form of social integration--will also be conspicuous in the early phases of recovery.[200] (3) There may appear some tendencies for a "retreat into the primary group," especially the family, and a consolidation of ethnic minorities in the months of social disorganization following the attack.[201]

One feature of the recovery process is that such undifferentiated social arrangements will give way to a more differentia ed social structure, though the precise timing and directions of change cannot be predicted. The therapeutic community will give way to more complex, enduring forms of social integration; autonomous market structures will emerge; educational institutions will begin to operate with less concentration on the political crisis at hand; medicine can assume a role that is less directly subordinated to the pressing needs of rehabilitation and welfare. These processes of change will unfold, moreover, in different ways and at different speeds in the different institutional spheres. Because of this irregularity, the society will likely experience periodic social disturbances and political conflicts in the decades after attack. In some respects these long-term processes of institutional change will be unlike any other processes of social change in the history of human civilization. But by characterizing the processes in general terms--as a balance between differentiation, integration, and social disturbances--it is

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[200] Above, pp. 631-632.

[201] Smelser, The Social Aspects of Nuclear Attack, op. cit., pp. 249-251.

possible to examine how our general knowledge of processes of long-term social change can inform our attempts to understand and predict the recovery process.

The Refinement of Comparative Knowledge about Post-Attack Society

In this essay I have been preoccupied with the canons of scientific method by which an investigator attempts to arrive at reliable empirical propositions relating to nuclear attack and recovery.[202] I have scarcely raised the subject of scientific theory as such, which involves the formal derivation and organization of systems of propositions. In this final section I shall make some preliminary observations on how empirical knowledge yielded by the methods outlined in this essay may be raised to a more adequate theoretical level.

More specifically, I shall discuss two kinds of theoretical refinement: (1) Taking the analysis of role-conflict as an example, I shall demonstrate what steps are necessary to set precise limits to empirical generalizations about post-attack society. In most of the illustrations throughout the essay, I have assumed empirical associations to be simply present or absent. Such an assumption involves an oversimplification, since most empirical associations--especially in the social sciences--are far from perfect, and are observed only under limited conditions. In the discussion that follows I shall attempt to set forth procedures by which limits can be placed on these associations. (2) I shall examine the criteria for creating formal models and theories of recovery.[203]

In pursuing these lines of theoretical refinement, I shall be even more speculative than in the rest of the essay. Furthermore, my illustrations from the literature relevant to the analysis of nuclear attack will be held to a minimum.

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[202] The one exception to this statement is found in the section in which I create a more or less formal typology of levels of comparative analysis. Above, pp. 595-608.

[203] Throughout the essay I have been interested in the ways and means of establishing empirical relations among variables. The discussion of the difficulties of defining societal vulnerability and societal recovery did, however, point in the direction of the need for a statement of systematic relations among propositions. Above, pp. 602-605.

The reason for this is that the literature on disaster--including the literature on nuclear attack--is, with few exceptions,[204] lacking in theoretically refined models. Most of what is developed in this section, therefore, will have to be a statement of what theoretically adequate knowledge should look like, not what it does look like.

Theoretical Refinement: The Assessment of Role-Conflict and Its Consequences in Post-Attack Society. The concept of role-conflict appears frequently in the disaster literature both as a dependent variable (created by disaster) and as an independent variable (determining various types of behavior in disaster). With respect to the status of the concept as a dependent variable, Barton summarizes the literature as follows:

> . . . membership in numerous groups, in each of which we have roles expected of us, is a normal condition. Usually there is a time and a place for each status and its activities· we schedule our time between working, family, organizations, friends, and so on. A disaster breaks down this normal scheduling of status responsibilities by creating simultaneously urgent needs for many of these groups. Many organizations are in trouble, many families are in trouble, and many neighborhoods are in trouble at the same time. The individual as he sees or guesses at the scope of the disaster becomes aware of the multiple demands upon him of the most urgent sort. . . this can create psychological conflict and possibly interpersonal conflict.[205]

As an independent variable in disaster, role-conflict has varied consequences for individual behavior, but some research has indicated that individuals who experience severe role-conflict are more likely to display "disorganized" or panic-like

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[204] For example, Winter, Economic Viability after Thermonuclear War, op. cit.

[205] Social Organization under Stress, op. cit., p. 46. Barton's summary is based mainly on Killian's well-known investigation; Lewis M. Killian, "The Significance of Multiple-Group Membership in Disaster," American Journal of Sociology, LVII, 4 (January, 1952), pp. 309-314.

behavior than those who do not. According to the research findings of Form and Nosow,

> Dysfunctional behavior may be expected from persons physically removed from the disaster scene, but who are at the same time uncertain about the welfare and safety of their families. Such behavior may also arise when a person arrives at an impact area and is either unable to locate his family or finds that his family has been injured and that others have removed them from the area... The data on panic and shock show that most people in conflict did not undergo panic or shock, but that most people in panic or shock did evidence some conflict in their behavior. In both cases, the existence of some functioning social organization in which the person could assume a significant role was the crucial variable in minimizing dysfunctional behavior.[206]

Applying these research findings to nuclear attack, we would, according to the program outlined above,[207] estimate the size and pattern of nuclear attack and the disposition of persons in the target society (according to role-location); and, on the basis of these operations, estimate the incidence of role-conflict during the warning and impact phases, thus attaining an estimate of the probable incidence of "disorganized" behavior resulting from role-conflict.[208]

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[206] William H. Form and Sigmund Nosow, Community in Disaster (New York: Harper and Brothers, 1958), pp. 85, 109-110. See Barton's general review of similar findings--and some apparent exceptions--in Social Organization under Stress, op. cit., pp. 46-58.

[207] Above, pp. 583ff.

[208] Hill and Hanson perform this operation in a loose way: "Because the urban middle-class family is so typically involved in business, school, and other community organizations, there is a good possibility that family members will be widely scattered at the time of warning and impact. In nuclear attack grave problems of transportation and communication may arise as survivors seek to discover the fate of their loved ones. The potential for community disruption is obvious." Reuben Hill and Donald A. Hansen, "Family in Disaster," in Baker and Chapman (eds.), op. cit., p. 217.

When we examine the associations among disaster, role-conflict, and various forms of "disorganized" behavior, however, we discover a great deal of indeterminacy. First, because of the qualitative character of most of the data on disaster stiuations, the exact empirical strength of the relations between role-conflict and its consequences is not known. Second, the classifications of the ultimate dependent variable--"disorganized" or "dysfunctional" behavior--are imprecise. Third, many determinants other than role-conflict give rise to "disorganized" behavior, however we may identify it. Fourth, role-conflict produces many other consequences than "disorganized" behavior; much of the research shows, for example, that persons in role-conflicts simply turn to loved ones first and ignore other roles that conflict with loyalties to immediate family and other primary groups.[209]

How might these kinds of indeterminacy be reduced? Or, to put the question another way, how might more definite theoretical and empirical limits be set on the propositions that link disaster and role-conflict on the one hand, and role-conflict and "disorganized" behavior on the other? I shall mention five types of conceptual sharpening, which, if informed with appropriate empirical research, can provide a basis for theoretical refinement:

First, the concept of role itself should be clearly and consistently defined. As Levinson has pointed out, this concept is often explicitly or implicitly endowed with at least three meanings in the literature:

> a. Role may be defined as the structurally given demands (norms, expectations, taboos, responsibilities, and the like) associated with a given social position...
>
> b. Role may be defined as the member's orientation or conception of the part he is to play in the organization. It is...his inner definition [of the demands]...

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[209] "Not until all intimates (primary-group members) within reach are safe, will an individual willingly lend his support and aid to other persons. Only then will an individual help less intimate friends and organizations (secondary groups) with whom he identifies. Strangers may be aided, and then possessions and property are looked after--first one's own, then those of close friends and relatives, and finally those of others less intimate." Ibid., p. 186.

c. Role is commonly defined as the actions of the individual members. . . in accord with or in violation of a given set of organizational norms. . .[210]

It is certainly legitimate for the investigator to consider these several aspects of role--indeed, it may be to his advantage to do so--but it is incumbent upon him to be clear at all times as to which meaning is being employed. As Levinson points out, many writers in sociology and psychology tend to scramble these several meanings into a single omnibus concept, thus producing a construct which tacitly asserts a questionable unitary relation between the external demands of a role, individual orientations toward the demands, and individual behavior with respect to the demands.[211]

Second, the concept of role-conflict should be distinguished from closely related concepts. Parsons defines role-conflict as "the exposure of the actor to conflicting sets of legitimized role expectations such that complete fulfillment of both is realistically impossible."[212] While this definition is fairly succinct, certain vaguenesses hide in the words, "legitimized" (cannot some role demands be semi-legitimate or even illegitimate and still create role-conflict?); "complete" (do role-demands have to be completely filled to avoid role-conflict?); and "realistically" (by what standards shall "realistically" be determined?). Until such words are given more specific references, role-conflict is difficult to locate empirically, and difficult to set off from other phenomena.

Several other concepts are closely related to role-conflict, but should not be confused with it. "Role-ambiguity," for example, refers to the fact that role-expectations are not understood by the actor. Some of the consequences of role-ambiguity (e. g., anxiety) may be the same as those of role-conflict, but analytically the two concepts can be separated; ambiguity refers to lack of role definition, whereas conflict refers to counter-pressures set up by two or more

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[210] Daniel J. Levinson, "Role, Personality, and Social Structure in the Organizational Setting," The Journal of Abnormal and Social Psychology, LVIII, 2 (March, 1959), pp. 172-173.

[211] Ibid., pp. 173-174.

[212] Talcott Parsons, The Social System, (Glencoe, Ill.: The Free Press, 1951), p. 280.

defined role-expectations. Even if the definitions of role-ambiguity and role-conflict are clear, further conceptual problems may arise. Is it possible for two ambiguous sets of role-expectations to come into conflict? How can they do so if the expectations are not specified? How definite do role-expectations have to be to be capable of coming into conflict? Or even further: Suppose that from the standpoint of external demands two roles are ambiguous. Suppose, further, that the actor, by his own interpretation of these demands, makes them definite in his mind, and in this way they come into conflict? Is this type of role-conflict (which is generated intrapsychically) the same in its consequences as role-conflict that is situationally imposed?[213] Such questions do not lend themselves to easy answers. But they must be faced directly if the investigator is to have a conceptually adequate definition of role-conflict.

Third, it is essential to distinguish among the relevant types of role-conflict. Two illustrations of this requirement follow: (a) In the immediate post-attack situation, a number of different types of role-conflict are possible--conflict between the impulse of self-protection and the impulse to carry out some performance on behalf of others; conflict between turning to one's family and turning to other groups; conflict between playing a "heroic" role and carrying out routine occupational demands; and so on.[214] Different behavioral consequences may be expected to flow from these different types of role-conflict. (b) In the immediate post-attack situation, most role-conflict is likely to be immediate and urgent; in the later phases of recovery role-conflict is likely to be chronic--for example, the conflict between the tendencies to withdraw into the primary group for support and to devote energies to roles important for the recovery process; or the conflict between loyalties to ethnic groups and loyalties to the nation. The behavioral consequences of short-term, critical role-conflict are different from those of long-term chronic conflict.

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[213] This question shows the importance of distinguishing between external demands and personal orientations toward role-expectations.

[214] This classification borrows from Killian, "The Significance of Multiple-Group Membership in Disaster," op. cit.

Fourth, it is necessary to specify the consequences of role-conflict for the individual actor. From the psychological standpoint role-conflict, like many other types of strain, gives rise to anxiety, hostility, and fantasy. If the actor acts on the basis of these psychological states, the results may be flight, interpersonal conflict, apathy, some form of deviant behavior, or attraction to a collective protest movement.

Fifth, however, it is necessary to specify the conditions under which one rather than another of these consequences is to be expected. All role-conflict does not give rise to all these consequences; sometimes one consequence predominates. To specify these conditions, it is necessary to identify certain counter-tendencies to role-conflict and its consequences. These counter-tendencies are of two types: (a) Psychological: the individual who experiences anxiety or hostility engendered by role-conflict may "handle" these effects intrapsychically, e. g., by characteristic mechanisms of defense, thereby "heading off" the behavioral consequences suggested above. (b) Social: certain control mechanisms--such as hierarchy of role-obligations, temporal scheduling, etc. --may reduce potential role-conflict.[215] In addition, there may be structured opportunities for "blowing off steam" legitimately;[216] examples are institutionalized "griping" and institutionalized antagonism between class and ethnic groupings. In so far as these psychological and social factors "cushion" the behavioral consequences of role-conflict, they must be counted as determinants of these consequences. Furthermore, in so far as one type of consequence of role-conflict (e. g., hostile outbursts) is more nearly "cushioned" by these psychological and social factors than another (e. g., public apathy) this creates a presumption that the latter is more likely than the former to be a response to role-conflict.

These refinements work to set more precise limits to the associations between disaster and "disorganized" behavior as mediated by role-conflict. To

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[215] These kinds of protection against role-strain are discussed in Robert K. Merton, "The Role-Set: Problems in Sociological Theory", British Journal of Sociology, VIII, 2 (June, 1957), pp. 106-120.

[216] For a discussion of several ways of "structuring out" tendencies to deviance that result in part from role-conflict, see Parsons, The Social System, op. cit., pp. 303-308.

summarize, if we are to have a theoretically determinate account of these associations, it is necessary to have a conception of role-conflict that is (a) consistently defined, so we are aware of the entity that is being analyzed; (b) clearly set off from related concepts, so that its unique determinants can be discovered; (c) broken into sub-types, so that the different determinants and consequences of role-conflict can be more adequately specified; (d) linked with a determinate number of behavioral consequences; and (e) assessed in connection with a number of psychological and social counter-tendencies to these consequences. Only if such refinements are spelled out in detail--which they are not done in contemporary social-science literature--will we possess a theoretically determinate account of the propositions linking disaster with some of its most characteristic behavioral consequences.

The Creation of Formal Models of Attack and Recovery.[217] The literature on the social aspects of disaster has produced few theoretical statements.[218] I shall illustrate my remarks throughout by reference to the work of Anthony F. C. Wallace,[219] whose formulation of the stages of disaster and recovery comes closest to a formally adequate theory.

The first requirement of a theory of change is to specify the state of society at the beginning point of change (in this case society just before the onset of attack) and at the end of the sequence of change (in this case society after some

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[217]The criteria for models of change that follow are not limited to the situation of nuclear attack and recovery alone; indeed, they are general requirements for any theory of social change.

[218]Many writings that treat disaster-and-recovery as a general type of social change or treat it in theoretical language fall short of theoretical adequacy in that the discussions are mainly programmatic or remain at the level of empirical generalizations. For examples of such discussions, see Dwight W. Chapman, "Dimensions of Models in Disaster Behavior," and Gideon Sjoberg, "Disasters and Social Change," in Baker and Chapman (eds.), op. cit., pp. 305-336, 356-384.

[219]Human Behavior in Extreme Situations (Washington, D. C.: National Academy of Sciences--National Research Council, 1956); Torn do in Worcester, op. cit.

process of recovery). Depending on how complicated the theory of change is going to be, the investigator may wish to specify several alternative beginning and end points. It is essential that these beginning and end points be described under a common conceptual framework. A sample version of these categories is found in the classification of dependent variables earlier in the essay.[220]

In facing this first theoretical requirement, Wallace characterizes the beginning of a disaster-recovery sequence as a "steady state" of society.[221] He describes this state as follows:

> This is the system of regular energy-distribution (action) obtaining in all of the ultimately affected areas at the moment just preceding the warning period. The system will probably be in equilibrium, or nearly so, at the time of any given disaster. By equilibrium I mean that energy discharges are of a repetitive and predictable nature, in response to chronic stresses; furthermore, such stresses are eliciting effective conventional responses. In other words, the cultural system, and the personalities of the population, are operating sufficiently smoothly to obtain stress reductions for the population, such that the total quantity of stress in the area at large is not systematically increasing or decreasing (although there will be random variation).[222]

The elements of the system of distribution are:

> ...terrain, topography, climate; the culture of the population involved (including their security agencies designed to protect them from disaster); certain non-cultural characteristics of this population, including the distribution of various demographic factors, and the distribution of personality types ("national character").[223]

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[220] Above, pp. 595-608.

[221] Tornado in Worcester, p. 7.

[222] Ibid., p. 7. This characterization of the "steady state" is similar to what I refer to as the "disposition of society at the time of attack" in this essay.

[223] Ibid.

Wallace describes the end-point of the disaster-and-recovery sequence simply as "recovery" or "irreversible change" in which "a new steady state will have been established somewhere between the situation at the end of. . . impact and the pre-disaster equilibrium system, toward the re-establishment of which rehabilitation functions were aimed."[224] Though the end-point marks a "change in system" from the original steady state, presumably the elements of the two equilibrium systems are describable in terms of the same language (natural setting, culture, personality types, etc.). Ideally, both the statement of pre-attack conditions and the statement of the recovery system should be in the form of determinate equilibrium systems; that is to say, all the relations among all the elements of the system should be stated as functions of one another. The present state of knowledge in the social sciences does not, however, permit such determinate statements.[225]

The second requirement of a theory of change is to chart the path of the system through a series of intermediate stages between the beginning and end points. Earlier in the essay I indicated a number of such stages.[226] Wallace specifies, in addition to the initial pre-disaster conditions and the end state of recovery, the intervening stages of warning, threat, isolation, rescue, and rehabilitation.[227] Ideally, each of these intermediate phases should be described in the same language of equilibrium as the beginning and end states, so a logically exhaustive classification of outcomes is possible at each stage. In practice, however, this cannot be done; the investigator more often settles for characterizing

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[224] Ibid., pp. 2, 12.

[225] For a discussion of the requirements of a genuinely "dynamic" of a theory of social action--as well as the difficulty of meeting these requirements in the present state of development of the social sciences--see Parsons, The Social System, op. cit., pp. 19-22.

[226] Above, pp. 608-610.

[227] Tornado in Worcester, op. cit., pp. 8-12.

each stage in terms of the major preoccupation of the system--e. g., with precautionary activity in the warning phase, emergency activity in the rescue phase, and so on.[228]

With these two requirements, the theory of change is still descriptive and static. As yet there is no statement of why the system moves from phase to phase, or why one outcome at any given phase is more likely than another. The third requirement of the theory of change, then, is to present a systematic and derived statement of determinants affecting the sequence at every stage. These determinants are of two kinds: (a) The equilibrium system of the previous stage. The character of pre-attack society, for example, determines in part the effect of the nuclear attack.[229] In so far as the description can be in general equilibrium terms, the precise ramifications of any type of impact can be traced to every part of the system. Furthermore, if the state of society can be characterized in general equilibrium terms, at the end of the shelter phase the precise impact of emergence can be traced throughout the system. (b) The introduction of new variables at each phase. The most dramatic new variable is, of course, impact itself. But at later stages other new variables are introduced, such as rescue efforts, attempts to mobilize people and resources for recovery, and so on. Ideally, a theory of social change should specify precisely at what point in the sequence each new variable is introduced. The resultant of the interaction of these several kinds of determinants is a moving equilibrium system, continuously affected by the systematic introduction of new variables, and working its way through the several phases of attack and recovery.

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[228] Ibid., pp. 8, 11. In my characterization of phases I also fell short of specifying equilibrium conditions at each phase; I merely specified the classes of variables that would rise to salience at each phase. Above, pp. 608-610. See also Smelser, "The Social Dimensions of Nuclear Attack," op. cit., pp. 219-220. When I apply the phrase "rise to salience" to a dependent variable I mean that it becomes an important problem confronting the surviving population during the phase in question; when I apply the phrase to an independent variable I mean that this variable accounts for a greater portion of variation in behavior than other independent variables in this phase or than it did in other phases.

[229] Above, p. 589. Also Wallace, Tornado in Worcester, op. cit., p. 2.

Wallace attacks these problems of dynamics, but necessarily in an incomplete way. First, as indicated, he divides the sequence into a number of time intervals in order to organize the many variables that feed into the disaster-and-recovery complex. In addition, he introduces a number of "space coordinates" as a means of locating variables in terms of their geographic distance from the point of impact.[230] Then, using these time and space coordinates as an organizing framework, he develops the notions of a "disaster syndrome" and a "counter-disaster syndrome," which, taken together, constitute a kind of moving equilibrium of forces, the balance among which determines the state of the system at each stage. The "disaster syndrome" includes those kinds of behavior that arise in response to the destructive agent. In the first stage people are "dazed" and "apathetic"; this initial response gives way to suggestibility and dependency, which is followed by an "ambivalent stage" of complaining and blaming; the syndrome is completed when individuals return to something approximating their pre-disaster state.[231] The counter-disaster syndrome is vividly illustrated in the hyper-active rescue behavior of the early stages (which "counters" the numbed, apathetic responses), but presumably continues into the later stages as well, counteracting the disaster syndrome at each phase.[232] As indicated, this notion of a moving equilibrium is only partially developed in Wallace's work, since only a few elements of a full societal equilibrium system are identified; nevertheless it is a step in the direction of a theoretically adequate organization of knowledge concerning the impact and recovery from crisis situations.

I should like to conclude this essay with a suggestion as to the type of research that is appropriate to our present state of knowledge. It should be apparent from the tone of the essay that our knowledge of post-attack society can be no better than the present state of theory and research in the social sciences.

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[230] Human Reactions in Extreme Situations, op. cit., pp. 18-19.

[231] Tornado in Worcester, op. cit., pp. 109-129.

[232] Ibid., pp. 141-146.

Our ignorance of the effects of nuclear attack stems only in part from the fact that we have very limited theoretical knowledge of social change that can be brought to bear on the anticipated effects of nuclear attack. Or, to put the point positively, the maximum rate at which our knowledge of the effects of nuclear attack and recovery can increase is the rate at which our general knowledge of the processes of social adaptation and change increases. The appropriate research strategy at the moment, then, is not to encourage the development of more and more refined statements as to the condition of post-attack society, but to encourage general research on a wide range of comparable experimental and historical situations so that our account of the effects of such a catastrophe can be built on a more solid empirical and theoretical foundation.

PART III

SOME APPLICATIONS TO PLANNING

When Etna basks and purrs,
Naples is more afraid
Than when she shows her Garnet Tooth;
Security is loud.

Dickinson

Chapter VII

SOCIAL DIMENSIONS AND DOMAINS IN PLANNING TO REDUCE VULNERABILITY

With Special Reference to the Uses and Effects of Shelter Systems

S. D. Vestermark, Jr.

The Place of Analytic Tools in Planning

The power of analytic tools in planning begins in the capacities to simplify and organize which they confer. Planners charged with preparations for reducing the vulnerability of a society and its sectors to nuclear attack or accident have especially acute needs for the power which analytic tools can provide. The scope of the potentially relevant data appears overwhelming: In considering the levels of potential social damage, planners may find themselves drawn to addressing data, generalizations, and theories on the whole range of institutional and behavioral phenomena which characterize the life of an industrial society. How can they reduce the vast reach and complexity of these data, so that they can have more coherent and more manipulable items of relevant information? After they have begun to reduce this potentially vast domain of information, how can planners organize emerging concepts, findings, and more theoretical statements into significant descriptions and predictions which can guide planning tasks toward effective measures for protecting complex social life and its preconditions?

Given the scientific and organizational limitations under which he must work, the planner has a triple task in beginning to answer these planning challenges. He must first find the appropriate tools. He must then apply them to the fundamental task of simplifying and organizing the domains of uncertainty inherent in the study of potential nuclear disasters. In this application, he must constantly retain a critical awareness of the biases and limitations introduced by his analytic tools.

Even with more limited subjects and goals, analytic simplification rarely proceeds in isolation from analytic organization. Procedures and mechanisms

used to simplify complex domains of data often assume or restrict the frameworks within which organizing principles and propositions can be drawn from observations of the real world.[1] But just as they have special need for analytic tools, those who plan for reducing and managing potential social effects of nuclear disaster must be especially sensitive to the interplay between analytic simplification and analytic organization. Without some organizing models and principles to guide the inquiry, it is difficult to gather and interpret useful data on either potential effects among large aggregates of individuals or large institutional domains which form major sectors in the social system. Yet, contained within these organizing models and principles may be rather ambitious theoretical perspectives. To create inventories of data using these models and principles is simultaneously to create pressures for restating the analytic tools and for building more adequate theory, particularly when anomalies appear in the data gathered with the use of these tools. The planner may become bewildered and impatient from the social scientist's desire to keep refining the analytic tools, even as he realizes that the scientific adequacy of the propositions upon which he founds his plans may depend on continuing this process.

Because of contemporary limits on descriptions of the full range of interacting, empirically observable social phenomena which create a society and its dynamics over time, and because of the inherent indeterminacies in speculating

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[1] The mutual dependence of organizing principles and procedures and mechanisms for simplifying perceptions and observations is, of course, a continuing issue of the greatest importance in the study of the philosophical foundations of scientific inquiry. See, for example, Thomas S. Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1962) and Edwin G. Boring, "The Dual Role of the Zeitgeist in Scientific Creativity", in Philipp G. Frank (Boston: The Beacon Press, 1956), pp. 204-217. But this issue is by no means confined to the study of scientific procedures. Indeed, it is at the heart of attempts to specify the fundamental psychological processes through which individuals come to have coherent sense data about the real world. See Leo Postman, Jerome S. Bruner, and Elliott McGinnies, "Personal Values as Selective Factors in Perception", in Guy E. Swanson, Theodore M. Newcomb, and Eugene L. Hartley (eds.), Readings in Social Psychology (Rev. ed.; New York: Henry Holt and Company, 1952), pp. 375-383, and Jerome S. Bruner, Jacqueline J. Goodnow, and George A. Austin, A Study of Thinking (New York: John Wiley and Sons, Inc., 1956).

about social disasters which cannot be directly studied, the planner will remain dependent upon the proper application of analytic tools at several stages of his work. No matter how effective the analytic tools, however, there comes a time at which the role of the planner and the role of the social scientist sharply diverge. This divergence is the product of the requirement that the planner both articulate and apply policy decisions.

Policy decisions are choices among action alternatives which have varying degrees of utility and desirability. While the social scientist may inform the policy-maker and planner of the possible utilities to be gained in a particular course of action, and show how the utilities from one course may contrast with the utilities offered by another, the social scientist cannot say which course --- and concomitant set of utilities --- should be chosen. This is because values and normative statements form the final criteria of desirability. While the social analyst may show the policy-maker and planner how a policy decision might achieve values, he cannot, as a social scientist, say whether that value should be achieved. This does not mean that the social analyst may not have strong opinions of his own as a citizen. What it does mean, though, is that even the value commitments of a scientifically oriented social analyst must lie in processes of value-commitment and value-assertion which exist beyond the domains of scientific validation and verification.[2]

Within a governmental system, the policy level both reflects and articulates the values of the government's constituency.[3] Insofar as planners design programs

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[2] An extensive literature on the relation between values and scientific procedures in the analysis of national security issues has evolved since World War II. This theme has been a principal preoccupation of journals such as Bulletin of the Atomic Scientists. For a debate on the proper role of ideological and value elements in the scientific analysis of measures for reducing the vulnerability of American society to thermonuclear attack, see S D. Vestermark, Jr., "Social Science as Systematic Anxiety: A Case Study in the Civil Defense Dialogue", Journal of Conflict Resolution, IX, 2 (June, 1965), pp. 264-287, and Arthur I. Waskow, "Social Science and Civil Defense: Problems in the Study of an Unprecedented Future", Journal of Conflict Resolution, IX, 3 (September, 1965), pp. 397-412.

[3] Note that this sociological definition of the value functions of the policy level is applicable to constituencies other than those of a democratic political system. Thus, the policy level of an authoritarian, one-party state may both

and measures for implementing value decisions which form the basis of policy choices, they must accept the value restrictions implied in the choice of one action alternative over another. Unless it has been specifically agreed that analytic tools can be used to criticize basic policy choices of action alternatives and to propose new ones, it becomes irrelevant for analytic tools to show that there are "better" ways of achieving valued states. Instead, the first value of the analytic tools for the planner will be in their ability to show him ways in which a particular action alternative may be realized. Here, an "action alternative" may range from quite specific measures to be taken in a given contingency, to the creation of the preconditions and processes required to build a whole new institutional domain in the society.

Of course, the more uncertain the policy arena, the broader may be the planner's role in defining the basic alternatives which the policy-maker needs to consider. The basic value, "Society should be preserved against the ravages of epidemics", may imply quite specific, though comprehensive, public health action alternatives. On the other hand, the value, 'Society should be preserved against the ravages of nuclear disaster", may imply many action alternatives, some of which will remain unclear so long as their target domains are unclear. If the process of fulfilling the value to preserve against nuclear disaster can be partialled into a number of subsidiary processes and programs --- such as preparations for taking public health measures against possible epidemics --- steps will have been taken toward translating the general policy value into specific action programs. As long as there are important questions about the dimensions of social vulnerability to nuclear attack, however, the planner may find that his role forces him to describe a number of basic problems which seem to merit solutions and a number of basic institutional domains into which programs and actions should enter, if basic goals in reducing societal vulnerability are to be achieved. He may find himself in the position of recommending new areas of policy concern to high levels of policy-making. His task may come to include defining criteria of both the existential and

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(Footnote 3, continued) represent and redefine the values which rank-and-file party members are thought to support. Where party membership is restricted, the constituency of the government may be much smaller than the total number of citizens of the state, even though the government may act in the name of all the citizens.

the desirable, as well as defining the criteria for implementing decisions to preserve the existential and achieve the desirable.

Organization of This Chapter. This chapter is directed especially to planners who must perform these types of broad functions. In particular, this chapter is an exercise in the application of both analytic and directly empirical techniques to the potential social effects of a nuclear disaster. The principal task will be to show how these techniques can define central issues in planning to reduce societal vulnerability to nuclear disaster and to enhance social resources and potentialities for recovery. The planners who form the special audience of this chapter are planners who occupy the bureaucratic position which was shown in paradigmatic form in Figure I-10, p. 167. Astraddle the worlds of policy values and goals on the one hand and administrative and operational requirements on the other, these planners must specify both the criteria and the specific characteristics of vulnerability-reduction and recovery-management systems.[4]

But this chapter is not intended to be a planners' guide. It would be beyond the scope of this volume to present a total inventory of planning propositions and techniques, and it would be beyond the scope of social science to claim solutions for what must ultimately be political questions and decisions about the desirability of comprehensive vulnerability-reduction and recovery-management systems. Instead, this chapter reviews the analytic techniques and empirical findings of the preceding chapters of this volume. It does so by rearranging these techniques and findings into a series of analytic principles and empirical statements. This series begins with a group of statements which summarize the analytic techniques and analytic decisions which were the basis for creating manageable conceptual and empirical issues in the social analysis of nuclear disaster. It concludes with a number of specific propositions, whose purpose is to show how particular post-attack social effects and processes could create requirements for particular systems to reduce social vulnerability, and how these effects, processes, and resulting

[4] For the basic view of organizational environments which has shaped this discussion of planners' functions, see above, "Organizational Characteristics Which Create Organizational Constraints", pp. 162-177.

system requirements become elements in a cumulative, total process which could create the interacting conditions required to reduce vulnerability and enhance the possibilities of recovery.

This chapter continues, therefore, with a listing of general principles for the analysis of post-attack social domains. Following this general analytic section is a more specific inventory of propositions about the domains of behavioral and institutional process within which specific social effects of attack will be expressed. A uniting theme of this total set of propositions is an important analytic and empirical finding of this volume: that the kinds of individual behavioral forms and institutional processes which are critical to managing the social effects of nuclear disaster will vary according to time after attack and conditions which have intervened between attack time and the time under immediate analysis. In short, behavioral and institutional domains have variable salience for analysis and planning after attack. Associated with each salient domain will be a number of salient decision points. A decision point which is salient at one time may be less salient at another time following attack, sometimes regardless of whether decisions have been made at other critical points.

These two summations of the findings of this volume provide a basis for restating the central issue confronting planners of systems to reduce social vulnerability and enhance social recovery. It is possible to see this issue as a problem of maximizing and managing the post-attack "social inventory", in order to maximize options for institutionally governed reconstruction within a moving but unstable social equilibrium system. With this reformulation of the central planning issue, it may then be possible to speak more clearly about the nature of social costs, of both the attack and of the systems intended to counter its effects. A brief consideration of the question of social costs in planning concludes this chapter.

The two propositional inventories in this chapter are neither theoretically nor empirically complete.[5] Many of the analytic statements depend on developments

[5] See the discussion of general characteristics of propositional inventories, above, pp. 45-59.

in social theory and social methodologies, if they are to be accorded the status of fully validated and tested propositions. To the empirical statements drawn from the essays in this volume could be added other generally stated, empirical findings. The purpose of these inventories is, rather, to show how it may be possible to create a basis for progressing from general analytic questions to more particular social dimensions and domains within which planners can perceive critical issues, as they respond to broad requirements to anticipate social stress and manage disruptive changes of great magnitude. As clearly as the format of this chapter and volume will permit, each procedural principle or substantive proposition will be framed in a language which suggests its status as an item of knowledge about the real world.

General Principles for the Analysis of Post-Attack Social Domains[6]

While these principles in all cases refer ultimately to the social effects of attack occurring in a real world, they are expressed in terms which reflect the analytic decisions and perspectives about the real world that were necessary before a unified empirical analysis could proceed.

> **A. 1. Axiom: The Persistence of Determinants. To degrees which may vary among individual cases and domains of behavior, pre-attack determinants of behavior and institutional process will continue to specify, constrain, and shape post-attack behavior in at least some significant ways.**

Without this axiomatic assumption, any attempt to consider the future following nuclear attack dissolves into radical indeterminism. Of course, the impossibility of subjecting propositions about social effects of nuclear disaster to direct test opens the logical and philosophical possibilities that the causal sequences

[6] For convenience in reference, the propositions of this section, which summarize analytic principles, procedures, and general findings that depend on both analytic tools and empirical evidence, have the letter "A" as a prefix to their individual serial numbers. "B" is the prefix for the more restricted empirical propositions about limited domains, which compose the following section of this chapter.

which govern present behavior and institutional functioning will be totally discontinuous with the causal sequences governing post-attack life. This is another way of saying that the world following nuclear attack will have no relation to the present world.

A number of anxious predictions or fantasies about the social effects of nuclear attack implicitly or explicitly assume that determinants of pre-attack behavior will not function in the post-attack social setting.[7] These fantasies of lapse are often intertwined into arguments which hold that the consequences of nuclear attack would be "horrible". But Sidney Winter makes more than a debater's point when he remarks in Chapter IV of this volume that "To defend the prediction that nuclear war would be horrible, it is obviously necessary to grant at the outset the relevance of presently available evidence not only on the physical and biological effects of nuclear weapons, but also on the reactions of human beings to particular experiences".[8] In Winter's words:

> Clearly, in the absence of any experiences by which to judge the ability of various procedures to predict the consequences of nuclear war, the only available standard for such judgments is the degree to which a given procedure is derivative of a theory that is well corroborated in other applications. This standard excludes from scientific discussion all statements to the effect that nuclear war is "not comparable" to any situation that has occurred previously, if such statements are understood to mean that events after nuclear war would be governed by their own peculiar laws, unrelated to any present reality. These statements merely assert the impossibility of useful discussion; they do not carry any weight for or against

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[7] One form of anxious prediction which appears ultimately to rest upon the assumption of this lapse of behavioral determinants is the prediction of social regression based on a "pandemonium model". An example of this prediction is Klineberg's statement, cited above, p. 72. But see Neil Smelser's commentary on this "negative utopian" form of thinking, above, pp. 213-215. In contrasting two forms of socio-economic development, as they provide models for post-attack behavior and recovery, Smelser explicitly assumes the persistence of determinants. Above, pp. 256-260.

[8] Above, p. 332.

> a specific prediction. If the logic of such statements is applied impartially, it puts the prediction "nuclear war would be horrible" on the same level of meaninglessness as the prediction "nuclear war would be delightful".[9]

In the present analysis, therefore, the axiom of the persistence of determinants does not beg the important questions. The important questions are, "What are the possible relations between pre-attack and post-attack phenomena?" "How does an understanding of pre-attack phenomena offer clues to post-attack behavior and its management?" The question is not whether there is any relation between pre-attack and post-attack behavior. To assert that there is no relation between pre-attack and post-attack social phenomena, and therefore no relevance in pre-attack evidence, is to suspend the continuity of empirical causation and to move toward an assertion based on faith. Except in its mood of potential pessimism, the thrust is no different from that of the radical optimism in an argument that nuclear disaster would have no effects on behavior or institutions, and that there are therefore no substantial grounds for worry. With consequences equivalent to suspending empirical causation, this optimistic argument suppresses the effects of empirical determinants.

> A.2. Principle: The Need to Specify Ranges and Limits. The primary analytic and empirical task is to specify ranges and limits of the social effects of nuclear attack, and to create the logic for specifying these ranges and limits; it will frequently be infeasible --- and sometimes unhelpful for systems design --- to make precise predictions of particular, limited effects which fall within known degrees of certainty.

Although pre-attack social evidence must be relevant to the analysis of possible post-attack events, the uncertainties inherent in the study of the social effects of nuclear attack make it difficult to know the degree of confidence which

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[9] Ibid. It is interesting to speculate on the extent to which proponents of the position, "Horror is the product of discontinuity", could consistently accept the proposition that social institutions can create dimensions for the horrors of deviant behavior in pre-attack society. See Footnote 102 above, pp. 133-134, and the paragraph to which it constitutes a reference.

attaches to any specific prediction of attack effects based on evidence drawn from the present-time or past. Furthermore, given the potential magnitude and complexity of the inquiry, it is difficult to know the extent to which any collection of specific propositions would effectively include all the critical possibilities and contingencies which might occur following especially a massive nuclear disaster. In the present volume, Neil Smelser presents the most systematic attempt to provide a tentative vocabulary for distinguishing among the degrees of confidence with which specific predictions can be asserted. Early in Chapter II, he suggests three distinguishable degrees of certainty:

> Optimally, each conditional prediction that follows --- e.g., the prediction that collective panic will occur in the event of nuclear attack, given the present warning and shelter arrangements --- should be accompanied by a statement of the degree of confidence with which the prediction is made. For, as I have indicated, some propositions about the consequences of attack and patterns of recovery are based on more reliable social-scientific knowledge than others. Unfortunately, in the present state of the social sciences, it is impossible to indicate precise probabilities or levels of confidence, especially about the types of propositions ventured in this essay. On the other hand, it is possible to give rough indications of confidence. In the material that follows I shall use the following kind of shorthand: I shall qualify with the word "probable" the propositions which are based on quite substantial research and can be accepted with considerable confidence; I shall qualify with the word "plausible" the propositions which are less solidly founded, yet do rest on fairly well established theory and research; and I shall qualify with the word "possible" statements that are consistent with general social-scientific knowledge but are more speculative in character.[10]

Smelser would join in conceding that these distinctions are preliminary and imprecise.

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[10] Above, pp. 222-223. In Chapter VI, Smelser examines the methodological bases for drawing inferences about post-attack social phenomena and for assigning degrees of confidence to these inferences.

Later in Chapter II, Smelser builds a convincing argument for the general proposition that under certain specifiable, "exceptional conditions" attending the warning of the attack and the movement of the population to shelter, "the probability of panic behavior" will be "fairly high".[11] As do many other particular predictions in this volume, this assessment of the likelihood of panic rests upon the possibility of a conjunction of a particular set of conditions or assumptions.[12] In effect, particular predictions and propositions frequently are examples of probable events which could fall within a given range of particular possibilities. Going a step farther --- to generate particular propositions under the present analytic constraints, it appears necessary to express these predictions as generalized examples within a range created by the analytic examination and reduction of varying types of empirical and theoretical evidence.

This suggests that the general framework and logic for the reduction of the available evidence must be able to show the ranges of possibility created by particular events occurring in a number of possible post-attack behavioral situations. It is here that the process of empirical generalization redirects the analysis to progressively higher analytic levels, in the search for the more general determinants of specific behavioral events in specific situations of action.[13] The outcom of this search is an analytic demonstration: that the translation of damage done at the level of the individual system and the social system to levels more independent

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[11] Above, pp. 228-230.

[12] In Chapter III, for example, David Heer acknowledges throughout that particular findings and general trends in his demographic analysis would shift withi certain ranges, given alteration in the assumptions and models he used for constructing his attack patterns; see especially p. 308. In Chapter IV, Sidney Winter uses two analytic models to demonstrate the dependence of economic viability and recuperation upon the quantitative values and relations among several key variables see pp. 390-396 and pp. 438-450. These models form points of departure for --- but do not strictly determine --- the analysis of institutional mechanisms through which viability and recuperation may be achieved. Of necessity, his analysis frequently shifts from the quantitative to the qualitative.

[13] Above, pp. 90-123.

of the situation of action can be best understood as occurring within the dimensions of social structure set by social institutions.[14]

The analytic necessity to consider the ranges and limits within which particular phenomena will fall has an interesting practical consequence for planning. Unless a particular phenomenon will be critical to vulnerability-reduction and recovery, and unless this phenomenon can be shown to be highly likely, it is difficult to justify allocating resources for a large-scale system to deal with only that phenomenon. As has already been shown, however, the interacting domains of uncertainty in the social analysis of nuclear disaster make it difficult to say not only whether a specific phenomenon is likely with a known degree of confidence, but also whether that phenomenon would be critical in the management of the attack effects. Therefore, it would appear that as a practical matter of wisely allocating resources, systems for reducing vulnerability must be predicated on attempts to encompass and manage a wide range of similar phenomena, any one of which could have potentially critical consequences. Systems which are designed for the purpose of vulnerability-reduction and recovery-management will be pre-eminently systems for managing controls on ranges of events and allocating resources to encourage the evolution of new ranges of events. Particular problems which will be critical but transitory and limited to particular situations of action --- such as the potential problem of "panic" --- will be managed through combining and focusing the capacities of several more generally conceived systems to deal with elements of these problems.[15]

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[14] Above, pp. 123-138.

[15] Thus, "panic" would be managed by the redesign of the general warning and shelter systems, so as to minimize threat and reduce the likelihood of pileups in queuing as people move to shelter. A general communication and control system which exists apart from the warning and shelter systems would have functional capacities designed to complement the warning and shelter systems. For example, an effective, generalized system of communicating with the population in a variety of non-emergency as well as emergency situations would have the pre-programmed capacity for rapidly processing and disseminating factual information, according to principles which would maximize the likelihood of credibility in reception and minimize the likelihood of arousing threats.

The analytic discipline imposed by the study of the social effects of nuclear disaster contains a safeguard against the danger of planners' becoming overly fascinated and bemused by particular phenomena which loom large in both social science and folklore. Of necessity, a vulnerability-reduction and recovery-management system must be predicated on dealing with a variety of potential particular phenomena, any one of which may occur with degrees of likelihood and certainty different from any other.

A. 2. 1. Distinction: The Analytic versus The Empirical. Analytic specification must be distinguished from empirical specification.

The central analytic philosophy of this volume is that of "scientific nominalism". This position explicitly distinguishes the process of analyzing and labeling phenomena in a real world from those phenomena themselves. In Chapter VI, Neil Smelser applies this philosophical position to the way in which the observer discriminates analytic characteristics and variables:

> With respect to this characterization of dependent variables I hold an explicitly nominalistic position: that the dependent variables are not in any natural way "given" in social reality, but are the product of a selective identification of aspects of the empirical world of social phenomena by the investigator for purposes of scientific analysis.[16]

While the analytic perspective is a way of conceptually manipulating aspects of the empirical world, it does not form a domain of "realities" apart from the world of empirical phenomena. Analytic tools may have their own characteristic rules and procedures, from which derive pressures on the analyst to be complete and closed in his analysis, but these tools are constantly subject to tests of validity and reliability, as the analyst uses them to depict empirical reality and draw inferences about it. Because of this constant use of analytic tools to map empirical reality and manipulate it conceptually, and because of the requirement that these tools be constantly and demonstrably relevant to the empirical world, there may sometimes be a blurring of the difference between an empirical perception and an analytic construct. The distinction between the analytic and the empirical remains

[16] Above, p. 586.

clear, however, if it is remembered that the use of analytic tools begins in the conscious, selective identification and description of a world being systematically observed.

Thus, for the purposes of this volume the process of empirical specification begins in tracing and describing the actual, limited events which, over time, are associated with a particular, observed outcome. The process of analytic specification begins in showing how categories of events are associated with categories of outcomes.

> A. 3. Principle: The Situational Dependence of First Effects. In analytic terms, the first effects of attack are expressed in the "situation of action", which constitutes the concrete arena of human behavior; consequently, these effects are translated into behavioral and social effects in the form of effects on individual and social systems, which are systems of behavioral ordering that are relatively "dependent" on the situation of action.

This principle is the product of a sequence of analytic discriminations which were undertaken in Chapter I for the purpose of describing the ways in which attack effects in the reorganizing physical world are translated into effects in the empirically observable, social world.[17]

> A. 3. 1. Subsidiary Principle: Relative Situational Dependence of Social Effects. Systems which order and specify behavior are more or less dependent on the situation of action. Analytically, actual first attack effects must be expressed in systems that are more dependent, before they can be translated hierarchically into effects in systems that are less situationally dependent. Empirically, damage against individual system and social system elements is more likely to be quickly experienced after attack than damage to the ecological and cultural systems. A dual hypothesis for further study results: The ability to estimate damage to a society will lag significantly behind the ability to estimate damage to individuals; furthermore, there is no necessary one-to-one relation of direct proportionality between the number of situations of immediate damage to individuals and the amount of damage done to the whole society.[18]

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[17] Above, pp. 25-37, pp. 82-138.

[18] On this dual hypothesis, see Footnote 91 above, p. 110.

Perhaps the most appealing intuitive criterion of a vulnerability-reduction or recovery-management system is the number of individual lives which it can save per dollar expended. The "best" system is, then, that system which saves the most lives for the "least" money. Moving a step beyond intuition in one direction, a more sophisticated view of this same criterion would acknowledge the relatively fixed nature of the capital investment required for a minimum system, and would hold that the proper criterion would be achieving the maximum number of lives saved per marginal increment of resources expended.[19]

These criteria have a certain intuitive appeal within the American value system, which requires that all individuals have equal opportunity (in this case, for survival). Thus, the system which offers the most Americans the greatest opportunity for survival would be the "best" system. Underlying the appeal of these criteria may also be the intuitive realization that as a social phenomenon, attack does, first of all, strike individual organisms in their situations of action. The analytic principle which holds that the first social effects of nuclear attack will be expressed in those organic and behavioral systems which are more dependent on the immediate situation of action merely formalizes the fact that social damage begins with people.

In the longer run, however, a criterion based on an assessment of damage to systems which are highly dependent on the situation of action may neglect the ways in which any events in situationally dependent systems may have effects in and on systems which are relatively independent of situation. The planner may think it sufficient to use his resources to "save lives", arguing that it will be possible later to improvise means for supporting these lives. But consider a post-attack setting in which large numbers of individuals living in urbanized populations have been saved, while communication, transport, and distributional facilities have been wrecked and inventories of commodities required for survival have been spoiled or made inaccessible. In the long run, what will have been the effective

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[19] A closely similar criterion has been used in costing the current fallout shelter program. See the discussion above, pp. 160-161.

marginal increment in lives saved? What institutional as well as personal pressures will be created by these disparities?

With limited resources to expend, the present Federal fallout shelter program has emphasized the perceived "first job" of saving as many individual lives as possible. It has been necessary to defer planning and building systems which would increase the probability that the total surviving population could be supported, maintained, and directed in a variety of post-attack social settings, so that a total set of recovery requirements could be met. There is certainly no doubt that budgetary, political, and ideological pressures have required this concentration on a simplified version of the "first job". Yet, it is possible that it has been difficult to think of systems beyond the first job, because of uncertainties about how to conceive these systems. How does a planner conceive of specific systems which would utilize or modify basic social institutions to decrease societal vulnerability and increase recovery prospects? Are there feasible ways of managing events and programs which will affect the composition of the ecological and cultural systems of society? Would it even be important to think about problems on these levels?

At this point, a natural temptation would be to try to present a well integrated discussion of various systems that might be devised to manage "society" on these levels. Unfortunately, such a discussion would be premature; it would soon take on a utopian flavor.[20] To demonstrate some of the problems in meeting needs for systems which affect patterns beyond the immediate situation of action, it may be useful to compare the general social situation following nuclear disaster with that of another kind of social disaster --- the race riot.

A Note on the Watts Riot of August, 1965. During a week long period of crisis which began on August 11 and abated on August 17, 1965, a significant minority of the Negro community in southern Los Angeles, California, was in a state of riot and insurrection. Centering on the Watts area of the city, this widely

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[20] Principle A. 5., below, p. 685, suggests the impracticality of attempting to design systems on one level which can fully control behavior on another level. Utopian thinking begins in forgetting the empirical difficulties which this principle summarizes.

spread disorder resulted in 34 deaths, at least 1,032 others wounded or hurt, 977 buildings affected by looting, damaging, or total destruction, and approximately $40,000,000 in property damage.[21] The vast damage and the residues of rage and fear left in Los Angeles prompted many efforts to prevent another outbreak. These efforts quickly led to inquiries into what had "caused" the Watts Riot.

It is in the search for causes of this riot that the analyst of nuclear disaster may gain insight into the role of systems of behavioral specification which are not immediately dependent upon the situation of action. The immediate cause was "the arrest of a drunken Negro youth about whose dangerous driving another Negro had complained to the Caucasian motorcycle officer who made the arrest".[22] Of greater interest to the analyst, however, are the other "causes", identified in the official report on the riot. In spite of Los Angeles' number one ranking among sixty-eight cities examined by the Urban League on ten basic elements of Negro living, the official report found the almost tenfold increase in the Los Angeles Negro population between 1940 and 1965 had been accompanied by persisting problems which Negroes had experienced elsewhere.[23] These problems included not enough jobs, insufficient schooling, a profound resentment of police authority, disillusionment with the effects and intentions of recent social welfare measures and their administration, and the example of violence and disobedience as a means for redress.[24] Even before the official report presents its detailed chronology of what happened during the riots, it presents a central finding of the official inquiry: the "dull, devastating spiral of failure that awaits the average disadvantaged child in the urban core".[25]

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[21] Governor's Commission on the Los Angeles Riots, Violence in the City --- An End or a Beginning?. Report by the Governor's Commission on the Los Angeles Riots (Los Angeles, Calif.: Governor's Commission on the Los Angeles Riots, December 2, 1965), pp. 1-2. The present discussion draws on this official account, as tempered by the observations of the present writer, who witnessed riot activity in Watts at intervals during the four peak days.

[22] Ibid., p. 1.

[23] Ibid., pp. 3-4.

[24] Ibid., pp. 2-4.

[25] Ibid., pp. 5-9.

Later, fully one half of the pages of the official report explore in detail the socio-cultural, economic, and ecological problems which have prevented the development of effective Negro participation in the social institutions of Los Angeles.[26] Uniting the entire discussion of the causes of the Watts Riot is the theme that disadvantage, disillusionment, and isolation from community institutions created the conditions within which it was possible to precipitate "an explosion --- a formless, quite senseless, all but hopeless violent protest --- engaged in by a few but bringing great distress to all".[27]

The official analysis of the causes of the Watts Riot briefly treats the igniting incident, then moves quickly into processes and levels often far removed from the immediate situations of action in the riot. Similarly, the proposed remedies only briefly deal with organizational and tactical changes which might increase the ability of the police to enforce the law within an atmosphere of greater Negro trust.[28] It is in the sphere of building a basis for Negro participation in social institutions that the report is much more comprehensive.

Assuming for the moment that the official report is a fair-minded presentation of the different kinds of "causes" which combined to create the Watts Riot of 1965, it is to be observed that the social determinants of the outbreak specified behavior in an order which is in reverse to the order of specification which would occur in a nuclear disaster. That is, because systems relatively independent of situation were defective and because social institutions could not

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[26] Ibid., pp. 38-86. The amount of space devoted to these problems reflects an extensive effort within the official inquiry to take formal recognition and provide scientific definition of the full range of determinants of the riot, and to lay these pieces of evidence before Californians. It is worth noting this emphasis, in view of other emphases that could have been taken. For example, the writer's own experience suggests that some residents of the Los Angeles area would have been far more interested in learning about an official plan for more rapid suppression of the next riot. Others were particularly vehement about the need for Negroes to learn "responsibility".

[27] Ibid., pp. 4-5.

[28] Ibid., especially pp. 27-37.

effectively constrain behavior, "acceptable" individual behavior in immediate situations of action had potentially broader ranges of possibility --- up to and including individual acts which totally rejected conventional institutional constraints. For Watts, the institutional damage had come before the riot, and the riot was an event which forced recognition of institutional weaknesses. For Watts, the remedies appeared to lie in creating institutions, especially including stable patterns of occupational and consumer behavior, patterns for enabling oncoming generations to achieve more educational and civic competence, and patterns for committing individuals to concepts of community interest and responsibility. But there is an irony in being so aware of the need to create patterns beyond the immediate situation of action: Those events and processes which make institutional needs so clearcut also make the potential beneficiaries despair of the seemingly slow pace required to build both institutions and behavior governed by commitment to these patterns.

Before the riot, then, Watts was, in one sense, a kind of functional-equivalent-in-reverse to a society which had been so ravaged by major disaster that individual behavior patterns could no longer conform to institutional requirements which customarily shaped behavior beyond the level of the immediate situation. The kinds of measures required to build institutional patterns in Watts appeared relatively clearly, because of the order in which the determinants of individual action possibilities operated prior to and during the disaster. Compared with nuclear attack, Watts was a disaster in reverse --- generalized institutional defects created arenas for specific individual injuries. In a sense, the most significant damage had been done before the disaster, on the ecological and cultural level. The damage to individuals and to social patterns which the riot caused could be perceived as delayed-time "presenting symptoms" of this damage.

The analyst of nuclear disaster starts with institutions and social structure intact. His task is more difficult than that of the riot student, for he cannot assume that institutions will disappear totally, or that they did not exist. Instead, he must work from immediate behavioral and organic effects, to effects on institutions, social structure, and systems relatively independent of situation. Vulnerability is not a product of the absence of institutions or defects in existing patterns, but of

particular pressures exerted on institutions. Where institutions clearly do not exist, it would appear easier to manipulate determinants whose interrelations and dynamics are imperfectly understood. In the situation of mounting pressure after nuclear attack, it may be more difficult to understand analytically the conditions for patterns whose dynamics are not fully perceivable empirically.

Finally, in the case of a Watts Riot, there is the added analytic advantage of being able to define the lack of institutions by referring to their presence and characteristic patterns in a majority culture outside the deprived community. In a massive nuclear disaster, the potential institutional target is the configuration of institutions in the whole society. The reference in defining institutional patternings is to individual sectors within the entire nexus, and, ultimately, to the entire institutional nexus. To sort out the vulnerabilities and recovery potentialities of particular institutional sectors, the analyst must find ways of analytically segregating one domain of institutional effects from another, even while these sectors remain in interdependence within the total network formed by the institutions and social structure of the society.

In moving from the disaster of a riot to the disaster of nuclear attack, the analyst moves from a clearly definable, relatively isolated community and set of actors within a metropolitan social structure, to a total set of institutional processes which organizes both the social structure and individual behaviors within a national society. Somewhat paradoxically, as the analytic emphasis broadens to include the entire ecological and cultural systems of a nation, these systems become more difficult to discern as discrete systems with discrete patterns of effects. For Watts, institutions and measures taken at some remove from immediate action situations still remain relatively concrete remedies for isolable, visible problems. For a nuclear attack, institutions and more generalized processes of behavioral ordering become resources, which must be defined and managed even as they interact with other resource sectors. What seem to be manageable, visible remedies in Watts tend to become elusive resources in managing national stress. Consequently, it would appear to be far easier to insulate aggregates of individuals in shelters than to try to predict complex patterns of vulnerability in institutional systems, and then take steps to reduce the vulnerabilities and mobilize institutional resources for recovery tasks.

A. 3. 2. Subsidiary Principle: Temporal Lags and the Summation of Attack Effects. Since social damage can be analytically conceived to occur first in systems more dependent on the situation of action, effects on ecological and cultural systems occur later in time, as the result of complex summations of effects in many specific action situations. This is part of the analytic basis for saying empirically that it is impossible to select a single criterion for vulnerability or recovery, "since the various indices do not move along identical paths".[29]

Both analytically and empirically, "vulnerability" and "recovery" are concepts which lack single, unified referents. While this may turn out to be ideologically congenial to the multiple social and personal goals encouraged by American philosophies of pluralism, this principle creates a number of planning and operational challenges. For example, among the available criteria, which ones should be chosen? What are the standards for making the choice? The concept of "recovery" may pose a special problem. If a population is mobilized for sacrifice in the name of particular recovery goals, does the perceived legitimacy of both recovery goals and the authorities which administer them erode, as the goals must be redefined over time?

A. 4. Principle: The Sequential Ordering of Effects. Because social effects will be translated to different times and different levels of society, they will occur in sequential orders and time-dependent series, though a progression of determinants which vary in salience and consequence from one time to another.

This principle is both a summary integration of the first three analytic principles (including their subsidiaries) and a proposed analytic model which places social effects in interrelated causal sequences. Expressed verbally, this summary

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[29] The quoted phrase is Smelser's, from Chapter VI above, p. 604. Converted into an empirical proposition, this subsidiary principle would receive some support from evidence confirming the hypotheses proposed in A. 3. 1. above, p. 672. It should be noted, however, that these hypotheses pertain to empirical measures of the state of the whole society, whereas the present subsidiary principle derives directly from the analytic description of systems and levels within the society.

model proposes that because certain social effects must precede others, a given sequence of earlier and later social effects can be seen to form a regular progression through time on the same level of social analysis. The task of describing social effects over time begins, therefore, in determining the point at which each major sequence of social effects begins. It continues in the effort to follow the cumulative translation of effects over regular sequences within specific levels. It culminates --- as an effort to describe how individual sequences of effects interact and combine to form institutional and societal effects --- in the effort to show how a given sequence of social effects may create the preconditions for the beginning and the progression of other sequences of effects, on other levels and in other dimensions. The form of the model specifies that a temporally prior sequence of social effects can create the conditions and causes of a sequence of social effects which will occur later in time, in different domains of events.

Expressed schematically, the fundamental form of this analytic model is as depicted in Figure VII-1a, p. 681. Time intervals are arrayed horizontally, as t_1, t_2, and t_3. For convenience, they are portrayed as of equal length, although as an empirical matter, it is well established that the distinct phases of post-attack time will most probably be of different lengths.[30] At Time t_1, Effect A appears. This will be an effect which is relatively dependent on situation. This effect immediately creates the first conditions for two later, parallel lines of effects. On the level of Effect A, Effect A creates the conditions for a process of specification which will continue in Time t_2, and which in Time t_2 will be manifested in the appearance of Effect A'. As this process of specification continues into Time t_3, Effect A" appears. At the same time, Effect A in Time t_1 creates the conditions for the emergence of either a new category or new level of effects in Time t_2. These conditions from Effect A can be said, analytically, to combine with other situational effects and determinants at the phase boundary between Time t_1 and Time t_2, to cause the emergence of Effect B. Meanwhile, in Time t_2, Effect A has translated into Effect A', and it is A' which sustains the emergence of Effect B. In turn, while Effect B becomes B' and A' becomes A" at Time t_3, the conditions

[30] See the discussions above, for example pp. 195-201, pp. 220-222, pp. 359-362, pp. 608-643.

Figure VII-1a

PARADIGM FOR A STEPPED PROGRESSION:
SEQUENTIAL APPEARANCE AND ORDERING OF DETERMINANTS

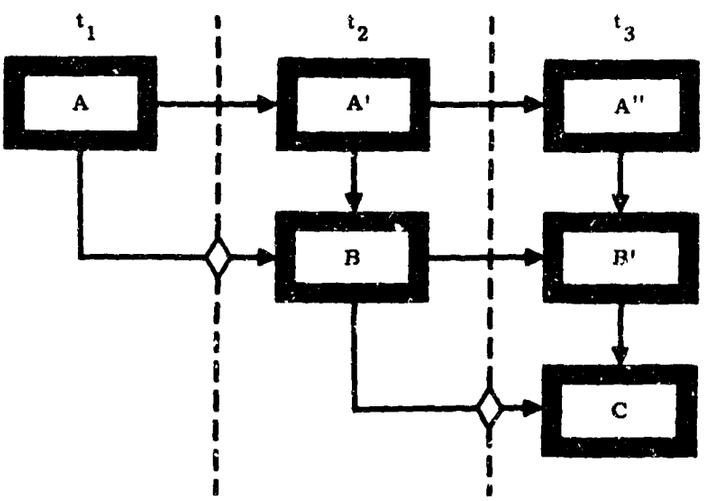
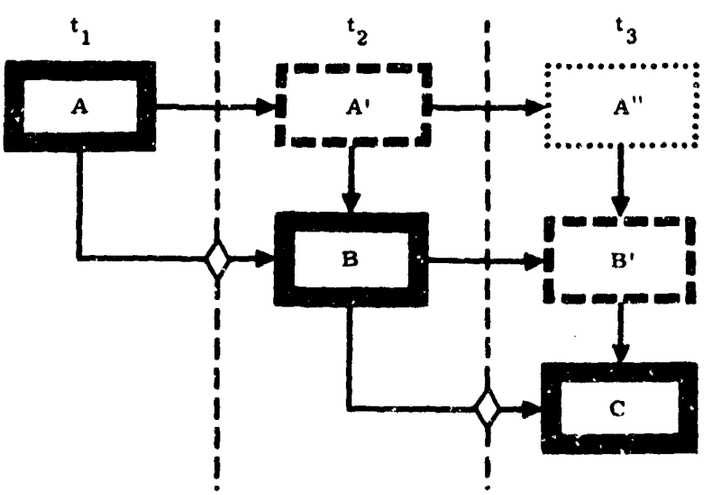


Figure VII-1b

PARADIGM FOR A STEPPED PROGRESSION:
SEQUENTIAL SALIENCE AND ORDERING OF DETERMINANTS



have been created for the emergence of a new category or level of effects, at a new level within the paradigm. This is Effect C, in Time t_3.

The process of translating Effect A into successive forms over time, while this level of effects creates the conditions for the emergence of other categories or levels of effects, is a process which occurs as a stepped progression of events. As events progress, new events --- B and C and their successors within their levels --- become salient as defining events and attributes of later temporal phases. At the same time, it is possible to conceive of events at Level A becoming less salient as t_1 moves to t_3. That is to say, as Level A events create conditions for later events at other levels, these later events may be more critical as effects in the social order and as subjects for planning requirements. In Figure VII-1b, p. 681, this sequential difference in the salience of social effects is suggested in a progressive lightening in the rectangular boundary which is used to show each event-domain. The formalism and symmetry inherent in this particular paradigm drawing leads, of course, to the visually based impression that at any given Time, the most recently emerged level of events is the "most salient". Following the visual metaphor of the "steps", critical salience follows the diagonal A, B, C . . . , which moves across temporal phases.[31] Empirically, however, it is entirely consistent with this paradigm to conceive of events within a given level as becoming more as well as less salient, in a succession of post-attack Times. Thus, events at B and C could conceivably create conditions and processes which would cause events at Level A to reemerge as both highly visible social phenomena and critically important subjects for potential planning requirements.

As stated here, this paradigm could represent events occurring within or among institutional domains and major systems of behavioral ordering in society. At a given institutional level, the paradigm could represent the processes through which one set of specific behavioral responses creates the conditions for other responses, later in time. On the other hand, among different categories of institutions or system levels of behavioral specification, events at one paradigm Level

[31] On the roles of metaphor and myth in the study of social stress, see above, pp. 65-81.

can be conceived as analytic determinants of events at another paradigm Level. As a general principle, events occurring earlier in time will be more dependent on situation. Thus, in applying the paradigm in Figure VII-1a/1b to particular analytic tasks, events at Level A may be particular social-behavioral phenomena which occur immediately after attack, and which create the conditions for other specific social-behavioral phenomena, later in time and farther removed in situation, at Levels B and C. Or, events at Level A may be events within systems which are relatively dependent on situation; these events are translated, in turn, into events in systems which are relatively independent of situation. The paradigm of Figure VII-1a/1b may be quite directly applied to problems of empirical description, or it may remain an analytic model for showing the general interdependencies which exist among major systems and levels of behavioral specification.

A. 4. 1. Subsidiary Principle: The Relativity of Concepts of "Vulnerability" and "Recovery" and of Definitions of Post-Attack Temporal Phases. Concepts of "vulnerability" and "recovery" will reflect processes occurring at different post-attack times. General concepts of "vulnerability" and "recovery" must allow for the simultaneous movement of different behavioral and institutional processes at different rates. Similarly, temporal schemes for analytically describing particular domains of phenomena and particular rates of institutional recovery must be relative, to reflect different rates and times required for recovery within different institutional sectors.

As is the main principle, A. 4., this subsidiary principle is partially a derivation of earlier analytic principles. The situational and temporal dependence of post-attack events means that it is necessary to conceive of both general societal vulnerability and general societal recovery as composed of sets of processes occurring on different analytic levels and at different phases in time. Indeed, characteristic temporal sequences among post-attack events form one practical indication of the existence of distinct sectors, levels, and institutional domains within which post-attack events occur. As Figure Ia-1, p. 198 above, shows, the contributors to this volume appeared to respond to this analytic fact, in their needs to devise different schemes for defining post-attack time phases. As the analysts moved away from considering specific behavior to considering processes of recovery

within domains of social structure and social institutions, the time phases became longer and relatively less determinate. Furthermore, among institutional domains compared at the same level of generality, there are differences in the length and definition of the temporal phases which are required to describe critical effects and central processes. It can be argued, therefore, that the contributors to this volume have provided a preliminary empirical validation to a principle which can be grounded in a total analytic point of view.[32]

But the analytic model which permits the differentiation of behavior and institutional processes into a stepped progression of determinants that unfolds over a succession of post-attack temporal phases simultaneously describes a total, unified process. Whether this process is the unfolding of a sequence of acts on one general analytic level or the interaction of determinants among several analytic levels, the paradigm of the stepped progression follows the logic of the analytic tools presented earlier in this volume.[33] This analysis shows how patterns of social effects can be seen to move from the immediate situation of action, to levels of social process which are less dependent upon the situation of action --- even though these less dependent levels may have set the general dimensions and behavioral possibilities of immediate action situations. This analytic translation of the empirically observable events occurring in particular situations of behavior underlies any attempt to understand how the institutional patternings, social structure, and systems which are relatively independent of situation can govern the response of a total social system to nuclear disaster. As a consequence of this analytic perspective, the actual conduct of the analytic translation by analysts and planners will be shaped by this principle:

A.4.2. Element of General Definitions: "Vulnerability" and "Recovery". "Vulnerability" and "recovery" are more than arithmetic summations of aggregate effects of and on the behavior of individuals.

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[32] Above, pp. 197-201.

[33] See, for example, Figure I-1, p. 36; Figure I-7, p. 111; Figure I-8, p. 115; Table VI-1, p. 607; and the discussion in pp. 90-123.

It is perhaps more appropriate to refer to this principle as an element of a definition or definitions than as a negative definition, since an effort has been made previously to suggest the specific, relevant domains of effects which do exist beyond "arithmetic summations of aggregate effects". Of course, this principle is primarily a principle guiding a procedure which does not depend on values. If "vulnerability" and "recovery" are defined in terms of the "desirable" or the "undesirable", then those with authority to define and assert what is desirable and what is undesirable must aid the social analyst in determining how vulnerability and recovery "are more than arithmetic summations of aggregate effects".

A.5. Principle: The Temptation to Overdetermine Specific Behavior. Given (a) the analytic and empirical uncertainties in describing the interactions among institutional processes and (b) the complex relations among domains of behavioral patterning and events in the situation of immediate action, those who plan or manage systems to reduce "vulnerability" or enhance "recovery" rates must avoid a natural temptation toward analytically overdetermining individual behavior, or toward assuming that decision and control on one institutional or social structural level can be fully translated to general control and particular behavioral specification on another, more immediate level.

This cautionary principle is a potential constraint on policy and plans. It is a necessary principle, because the analytic tools which show the relations between the various levels of behavioral ordering may lead the planner to believe that analytic understanding is an automatic key to practical control in immediate, empirically perceivable situations. For a number of reasons --- some scientific, some pragmatic --- this is not to be. As has been repeatedly emphasized, there are many indeterminacies remaining at many levels of the analytic framework and within many of the analytic tools which have been proposed in this volume.[34] In fact, one of the reasons why the analytic framework in Chapter I exhibits its characteristic form is because of the need to allow scope for these indeterminacies. A model of behavioral specification in society may successively narrow the determinants of action as the analysis moves toward particulars, and thereby increase

[34] See, for example, pp. 59-65, p. 102, pp. 119-123, pp. 222-223, pp. 446-450.

the ability of the analyst to predict categories of outcomes. Nevertheless, the result must still be that the analyst has specified ranges and limits to likely behavioral outcomes, not that he has traced his analysis to or from unit acts of behavior with full closure.

Practically, attempts to exert precise control over the complex relationships which govern individual and organizational acts in society quickly encounter severe difficulties. The economy has been an especially attractive sector for attempts at controls in industrial societies; Sidney Winter draws upon some of the difficulties which have hindered these controls, as he discusses the problems in designing a system of economic controls for post-attack society:

> ... it is imperative that the prospective adequacy of administrative resources be considered in relation to the control functions undertaken. If detailed directives are issued on the basis of inadequate information, the recipient is likely to find them irrelevant to his situation. If he requests clarification or revision, and receives no answer because officials are swamped with such requests, he may conclude that the system is an obstacle to the achievement of national goals. If inadequate information on demand conditions leads to prices in some markets being controlled at levels wildly inconsistent with market forces, the disappearance of supplies into black market channels may make the official allocation system meaningless and force everyone into the black market. If the number of personnel available for the investigation and punishment of violations is hopelessly inadequate, the example of flagrant and profitable violations by some will lead others to follow. The system will not always perform in exact proportion to the adequacy of the administrative resources; if resources are too inadequate, the system will simply fail.
>
> The attempt to achieve a reasonable reconciliation between estimates of what needs to be done in the way of economic control and estimates of what can be done should include an examination of alternative systems from the various points of view of the individuals whose behavior is to be influenced. Even a large and deliberate effort at such an examination is unlikely to identify all of the important modes of behavior that would appear if the system were in operation. ... Gross inconsistencies among different parts of the control system, leading to situations in which individuals must exert themselves strenuously to identify modes of behavior that are merely legal and productive, may escape detection if no attempt is made to "role play" an individual facing the

system as a whole. It is particularly important to examine in advance the situation of the typical plant manager in various industries. ...

... If the government were to limit itself to an effort to suppress undesired activities, and abstained from the detailed planning of desired ones, it could concentrate its enforcement resources on one or two very simple forms of direct control. For example, the ability to deny manpower, or plant and equipment, or electric power, or transportation, would certainly suffice to suppress the production of most commodities, provided only that the government could detect violations. The necessity of simultaneous and coordinated control of a wide range of productive resources arises only if the government wishes to achieve a certain detailed composition of output (beyond specifying what shall not be produced). It may appear desirable to undertake detailed planning of the composition of output if the institutions of the private economy are likely to function so ineffectively as to result in a total output far below the technological limits. However, it cannot be seriously argued that complete central planning of output in full detail, including quality and specifications, is feasible at the plan formulation level, let along enforceable.

... The level of detail at which control will be exercised must be chosen in a way that is compatible with the institutional devices that will settle the details that the control system neglects.[35]

In his assessment of a contemporary industrial system where attempts to institutionalize a "command economy" have dominated national life, Howard Swearer notes the crucial role of the Party apparatchik in dealing with problems of Soviet administration, when planning becomes bogged and performance falters.

The Party apparatchiki are both politicians, in the sense that they are experienced in organizing and manipulating the population and directing ideological and agitational activities, and professional administrators. Furthermore, these politician-administrators are above all generalists and troubleshooters whose forte is coordinating the diverse range of activities within a region and stepping in to resolve administrative tangles

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[35] Above, pp. 422-424.

and economic bottlenecks. They are normally intimately familiar with the economy of their area for they often assist or cajole industrial managers and farm chairmen directly.[36]

During national crisis, the rigid centralization of the Soviet system has been a source of vulnerability; administrators were forced to improvise, under stresses made even more severe by the continuing need to respond to the requirements emanating from a highly centralized administration which had strong capacities for exacting obedience.[37] Within the Soviet system, there has been a continuing tension between demands for control and needs for situational flexibility.

The general lesson of Principle A. 5. is to avoid being drawn by tight analytic schemes into the assumption that total control of events is feasible or desirable as a planning objective. Attempts at such controls could lead to crippling situational constrictions.

A. 6. Principle: Describing "Recovery" Combines Scientific-Analytic and Policy Tasks. Definitions of "recovery" may assume the restoration of previous states of society or the creation of new states based on the remains of previous states. Describing pre-attack and post-attack social states is a mixed analytic-empirical task. While the post-attack society and its domains of possible behavior and behavioral ordering constitute the basic inventory for social reconstruction and recovery, the decision to guide reconstruction in desired directions is a policy decision, not directly derivable from the logic used to describe existing realities.

While this principle largely derives from A. 4. and its subsidiaries, it is placed after A. 5. Although policy definitions of "recovery" may set goals which are unrealistic in terms of best available analytic and empirical projections of post-attack society, the practical constraints on their feasibility will begin in the extent to which the policy-maker and planner can effectively control post-attack realities This general capacity for control will depend upon several interlinked specific capacities and processes. First, some preliminary agreement on post-attack recovery goals must be reached. Initially, this agreement may be based

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[36] Above, p. 496.

[37] Above, p. 478. This generalization is drawn from World War II.

primarily on values --- for example, in a simple "restorationism" which prescribes total return to an unblemished, pre-attack state of affairs. Then, there must be some capacity for pre-attack projections and post-attack continuing assessments of the social characteristics of post-attack society. Upon this capacity to define and manipulate both the analytically revealed and directly empirical characteristics of post-attack society will depend the capacity for making relevant decisions about desired or required functional processes in post-attack recovery. In turn, these decisions must be translated into specific performances, as measured by several kinds of indicators.[38]

If policy-makers and planners use information about post-attack society which appears to be realistic, it is possible that they will experience conflict between what their information tells them and what their valued goals and aspirations require of them. In wrestling with this kind of potential dilemma, it will be necessary for the planner to recognize that his images of both the actual and the desirable post-attack world will be shaped by his analytic and empirical resources for describing it, and that these images may be further modified by lessons which can be drawn from realistic attempts to control events at their several levels. These reinforcing constraints on his image of the post-attack world will govern his assessment of the real social inventory available for recovery.

How to use this inventory requires policy decisions about ultimate goals as well as operational decisions about intermediate-range, instrumental goals. If both policy-maker and planner can accept the need to separate policy decisions, which are based on mobilizing images of the desirable, from the processes of describing the real world, which are based on analytic and empirical techniques, then they will be better prepared to decide the extent to which they should either exhaust their real inventory or bend their images of the desirable to fit the capacities of the real social inventory. It is not inconceivable that policy-makers and planners could set "unrealistic" aspirations, deciding thereby to risk exhausting the social inventory as they know it to be. But they should be prepared to recognize that this

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[38] On the question of the kinds of indicators, see Table I-5, p. 130; pp. 123-138; Table VI-1, p. 607; pp. 596-608.

was a decision of social policy, for which those who preside over images of the desirable may be accountable.

A. 7. Principle: Lack of a Unified Social Model for Planning Purposes. At the present time, criteria of vulnerability and recovery expressed in terms of the whole "social system" or "society" cannot assume a unified, fully tested model of the components of the total social system. These criteria will begin as analytic constructs, and they may or may not reflect assumptions about the desirable held in the political and cultural sectors of the total social system.

A. 7. 1. Generalization and Continuing Hypothesis: The Possible Differentiation of Domains Within the Social System. Within principal institutional domains of the social system, however, there may be functionally differentiable sub-systems and sectors, which perform empirically observable roles which are analogous to the analytically discernable functions performed by total institutional sectors within the total social system.

The main principle is a statement of conclusions presented in Chapter I of this volume, to which has been added qualifications deriving from the two immediately previous main principles (A. 5. and A. 6.).[39] On the other hand, the subsidiary principle (in this case, a continuing hypothesis as well as a generalization) points to a line of social analysis which has not only fundamental theoretical interest but also potentially significant consequences for defining the practical emphases of planning for post-attack institutional management.[40]

A. 8. Principle and Hypothesis: Indeterminate Relations Among Institutional Domains; Critical Decision Ranges Within Institutional Domains. (a: Principle) Society under the stress of massive disaster can be seen as a set of institutional domains whose interrelations are imperfectly understood, but (b: Hypothesis) each domain has a distinctive range of disaster-induced critical decision points, within which decisions affecting the longer term "viability" of that institution must be made.

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[39] See especially pp. 59-81, pp. 88-90, pp. 109-123, pp. 180-184.

[40] Specific topics upon which this analysis could concentrate in the next stages of developing the metaphor-models of Chapter I are suggested above, pp. 117-119.

"Viability", as a general term referring to institutional functioning, is the continued capacity of an institution to order individual and organizational behavior within the social system. The use of viability in this context is broader than, but analogous to, Winter's concept of economic viability in Chapter IV. There, viability is the capacity of the economy to achieve and maintain "levels of new production adequate to meet the most essential demands without drawing on inventories".[41] Under these circumstances, the economy can use inventory for forming new capital resources, and economic growth can resume. Pursuing the analogy with economic viability --- institutional viability can be said to be that generalized capacity of a given institutional sector to meet both requirements and expectations held by those who respond to it, without diverting a disruptive and potentially destructive amount of the respondents' attention and energies toward debates on the legitimacy of the institution and toward behavior which modifies or redefines institutional patterns. In short --- in different ways, social institutions will have post-attack "inventories" of capacities to order behavior at various levels. The central test of post-attack institutional viability will be whether behavior which is responsive to institutional requirements within a given sector will be responsive to demands which originate outside that sector. It is conceivable that although a given institutional sector could achieve viable functioning, demands originating outside that sector could disrupt the capacities of individuals to respond to its demands.

For example, it is possible that the institutional arrangements of marriage and family life would pass into the immediate post-attack social situation with the full commitment of the population. Indeed, these hallowed and traditionally satisfying arrangements might be familiar forms to which to cling, amid more immediate and visible pressures for alterations in patterns of social living. Suppose, however, that as a result of nuclear attack, a much larger than expected number of males perished. Suppose, furthermore, that there was a radical increase in the dependency burden, because of the increase in numbers of children with one or both parents missing.[42] Under these conditions, what would be the pressures on

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[41] Above, p. 361. See also pp. 389-419.

[42] Under reasonable, low-level attack assumptions, a significant increase in the number of orphans appears likely. Above, pp. 295-297.

the practice of marital monogamy within the marriage institution? What would be the pressures limiting the family's ability to maintain tasks of child-nurturance and child-rearing? What resistances would be encountered, if child-supportive functions were transferred away from the immediate family? How would pressures from other institutional sectors moderate these resistances? For example, would requirements for increased participation of increased numbers of adults in direct tasks of economic production be in the armamentarium of devices which planners and administrators could use to legitimize shifts in child-support functions away from the family?

That each major institutional domain has a distinctive range of disaster-induced critical decision points affecting its viability is an hypothesis which can be used to scan the different kinds of findings which have emerged in this volume. The finding that events in different institutional sectors appear to proceed at different rates suggests that some institutional processes and decisions may precede others.[43] An important analytic and empirical task would be, then, to find the sequences of critical decisions and processes which enable a succession of post-attack institutional problems to be solved, as the time after attack lengthens and as new institutional domains become salient to social reconstruction. The difficulty of this task is compounded, though, by the principle contained in the first clause embedded in the compound sentence which forms A.8. If the interrelations among institutional domains are only imperfectly understood, then it may be impossible to know all the important ways in which events in one institutional domain may affect events in another. Under the conditions set by principle A.8. and preceding principles, therefore, it may be impossible either to define the full range of critical events and decisions which contribute to viability within a given institutional domain or to define relations of mutual and sequential dependence within which institutions may form the structure for a rebuilding society.

A.8.1. Hypothesis: Critical Domains and Sectors. At different times following attack, events in one institutional domain or social structural sector may be more critical to survival and adaptation than events occurring in other domains of social phenomena.

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[43] Above, pp. 196-201.

A. 8. 2. Hypothesis: Social Preconditions to Mobilization and Viability. There are identifiable critical patterns of social structure which are preconditions to institutional mobilization and viability, within a given domain.

A. 8. 3. Hypothesis: Relations Between Social Complexity and Social Vulnerability. The greater the structural complexity and interdependence of a society, the more quickly will social damage be translated throughout the system, but more resources for recovery will exist, because of redundant capacities --- once these capacities can be organized.[44]

A. 9. Principle: Potential Applicability of Theories and Models of Social Change. Analytic tools required to specify and project social conditions following nuclear disaster may be seen as special cases of more general theories and models of social change.

The special province of theories of social change is depicting and describing the characteristics of total social systems, as social systems move from the

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[44]Hypothesis A. 8. 3. poses comparative analytic problems of such magnitude that it may not be possible to deal with them adequately until a valid, comprehensive simulation of different societal forms in their full detail can be achieved. For a discussion of simulation requirements, see above, pp. 37-44. As Smelser observes, industrial society would carry a large inventory of social, technological, governmental, and economic resources into the tasks of longer term recovery from nuclear attack; even under extreme circumstances, socio-economic development would not begin de novo. Above, pp. 256-260. On the other hand, Swearer argues that because of the greater social differentiation and resulting need for coordination, and the expectations of the population, complex industrial society is more vulnerable in the shorter run to disruption resulting from attack. Above, pp. 469-475, pp. 513-520. By the same token, the organizational capacities and skills of the population in a more complex society may make the processes of recovery go faster and with more efficiency, once they can be initiated. Ibid. This was partly Smelser's point. Because of these organizational and personal resources there are difficulties in arguing that simply because a population is large, it may be less vulnerable to massive disaster than a small population. Particularly where a smaller population is highly urbanized, the initial disruption and initial proportion of total loss may be greater. Yet, the social resources required for longer term restoration of industrial social processes may enable the more complexly organized smaller population to enter longer term phases of recovery more quickly, in comparison with very large populations which are beginning the basic processes of industrialization and social differentiation. See Heer's Footnote 8, above, pp. 273, 280, and the discussion of the relation between population and international position, above, pp. 272-281.

present to some future time. Difficulties in developing meaningful theories and models of social change begin in whatever limitations exist in efforts to describe and manipulate the dimensions and variables required to portray social systems in the present time. There is an enormous analytic and empirical task just in describing the configuration and interaction of the significant elements which form a total social system in the present time. To accomplish this present-time task, analysts frequently resort to simplifying assumptions and models.

In the present volume, for example, most of the analytic tools are devices for describing the society and its institutional sectors at instants in time.[45] While the economic models in Chapter IV and the simple model of recovery of population size in Chapter III do show how limited variables and assumptions might combine or interact over real time, most of the analytic techniques of this volume necessarily attempt to deal with states in the present time or, when the time perspective broadens toward the future, with a succession of fixed states at different times, viewed comparatively.[46] The metaphor-model introduced in Chapter I reflects the need to achieve an adequate description of present-time social system characteristics, before it is possible to project these characteristics into the future. The guiding system metaphor there "pictures social reality as a constellation of interacting components, so placed in reciprocal dependence that a change in one component will be communicated to the other components of the system and result in complementary changes in the other components. Any attempt to model the interactions among the group processes and institutions of complex industrial society will find it convenient to assume some version of the system metaphor, as the attempt is made to grapple analytically with the complex social structures and processes which produce reciprocal patterns of event and effect in society".[47]

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[45] Above, pp. 29-30.

[46] On the simple recovery of population size, see Figure III-8, p. 283, and the discussion, pp. 281-282. For the economic models of Chapter IV, see Figure IV-1, p. 392, and pp. 390-397; and Figure IV-2, p. 443, and pp. 438-451. On the comparative method as such, see Chapter VI above, and for a broad application of comparative techniques, see Swearer's analysis of the American and Soviet administrative systems, in Chapter V above.

[47] Above p. 40. See also Figure I-2a, p. 41.

In creating the analytic basis for projecting the social effects of nuclear attack, the contributors to this volume have been required to attend constantly to the general problems in describing and projecting the structures and processes of complex social systems. They have had to attend to the range of present-time analytic problems whose solution is implied in a full theory of social change.

The study of nuclear disaster forms an unusually vivid case in the general study of social change phenomena. "Social change" is, of course, a term which can include a large domain of events in society. Some of these events may appear only gradually, and apparently only as the result of the interaction of the elements of the social system to form new system characteristics. Other social changes may come with great rapidity. For example, they may represent the exploding of pent-up internal tensions in the institutions of society, as when a social revolution rapidly unfolds. Sometimes, such revolutionary changes appear to be ignited by a radical change in the political or ecological position of the society in which they occur.[48]

While it appears unreasonable to expect that nuclear disaster would trigger social revolution in American society,[49] it is nevertheless true that especially a massive nuclear attack would be an extraordinarily vivid point-of-origin from which to try to trace later social changes.[50] This suggests that if the events induced by nuclear attack could be seen as a special case within larger attempts to understand the processes of change within social systems, the insights offered by this special case could clarify the problems in projecting complex social phenomena through time-dependent sequences of causes and events. At the end of Chapter VI in this volume, Neil Smelser offers some preliminary observations on how the consequences

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[48]Perhaps the classic modern case is the Soviet Revolution and Civil War, whose immediate causes lay in the inability of Russian national institutions to cope with the requirements created by World War I.

[49]On this point, see above, pp. 244-260, pp. 502-531.

[50]On massive attack as a clarifying assumption in social science analysis, see above, pp. 150-154.

of nuclear attack could enter the study of those events following disasters which create processes of social change.[51]

Smelser cites the work of Wallace, "whose formulation of the stages of disaster and recovery comes closest to a formally adequate theory".[52] For Wallace, the disaster-and-recovery sequence begins in a "steady state" of society --- the ruling analytic model of society at this stage is that of the social system in essentially static equilibrium.[53] At the end-point of the disaster-and-recovery sequence is a state of "recovery", which is an essentially irreversible, new equilibrium state.[54] The problem is now, as Smelser says, "to chart the path of the system through a series of intermediate stages between the beginning and end points".[55] But why does the system move from phase to phase, and how is it possible to describe and predict the possible outcomes at each phase with sufficient closure to permit saying that one outcome is more likely than another?[56] The next requirement, then, is "to present a systematic and derived statement of determinants affecting the sequence at every stage. These determinants are of two kinds: (a) The equilibrium system of the previous stage. . . . (b) The introduction of new variables at each phase".[57] The study of social system dynamics in response to disaster depends, then, on the ability to specify the state of society that is subject to change, the intervening determinants which produce new and temporary, unstable equilibrium states, and the final equilibrium state which is the necessary outcome of a preceding process of specification. As Smelser summarizes it,

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[51] Above, pp. 650-655.

[52] Above, p. 650.

[53] Above, p. 651.

[54] Above, p. 652.

[55] Above, p. 652.

[56] Above, pp. 652-653.

[57] Above, p. 653.

> The resultant of the interaction of these several kinds of determinants is a moving equilibrium system, continuously affected by the systematic introduction of new variables, and working its way through the several phases of attack and recovery. [58]

In the concept of a moving equilibrium, the static descriptive models used to describe ranges and limits to possible post-attack social phenomena join with a model of how phenomena move through phases in time as part of a unified process. It is the description and prediction of this total process which, in turn, joins the study of general processes of social change with the study of events following massive disaster. For planners, this theoretical and analytic union may have significant practical consequences in defining the central problem of managing the post-attack social inventory.

> A. 10. Principle: Multiple Functions of Post-Attack Information. A given analysis, finding, or prediction about the post-attack situation may have more than one function in planning for and managing emergency. Such an increment to knowledge may be most vivid as a breaker of myths, but it may be more important to evaluate its significance as an item of additive knowledge --- unless, of course, myth-breaking is crucial to mobilization for viability and recovery.

In Chapter I of this volume, the main elements of this principle were demonstrated for the governmental bureaucracy charged with planning, building, and operating vulnerability-reduction and recovery-management systems. [59] It is a more general principle, however; in mobilizing and directing a population for the tasks of surviving and rebuilding, there may be much in the intellectual inventory of the planner which could be used to reduce anxieties and fears in the general population. Information will not allay all fear --- particularly if serious attempts are made to indicate the necessary ambiguities in information about the post-attack world. But carefully based information, delivered by sources of high credibility, may be among the indispensable preconditions for releasing whatever resources of energy and will a population can bring to the tasks of rebuilding a damaged society.

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[58] Above, p. 653.

[59] Above, pp. 162-177.

The Variable Salience of Institutional Domains and Decision Points in Planning: Some Empirical Findings on Maximizing the Post-Attack Social Inventory

The general principles which were presented in the previous section of this Chapter provide a number of rules and orientations for approaching possible social effects of nuclear attack from the point of view of a planner who must work in the pre-attack situation. A central theme in this total set of principles is the feasibility of subjecting complex ranges of possible social effects to analytic and empirical study, for the purpose of reducing social vulnerability to nuclear disaster. Another theme is that possible social effects form coherent, bounded domains of events, which can be described individually and in relation to each other. A number of general principles and hypotheses suggest that certain kinds of broadly applicable models and conceptual tools can be used to organize the several levels of likely behavioral and institutional effects following attack.

Now a dilemma arises. On the one hand, the planner may feel oriented to the general tasks of describing post-attack social life, but unsure about the specific events which are likely to occur. In spite of cautionary injunctions (see, e.g., Principle A.2. above, p. 667 ff.), he will continue to feel the need for particular descriptions of events which are likely to be significant in the design of vulnerability-reduction and recovery-management systems. He needs to know what is likely to occur and why it may be significant. On the other hand, it appears infeasible to provide a detailed, total description of post-attack society and its behavioral elements, arrayed in clear propositional form. Although there might be some disagreement among analysts on points of emphasis, Neil Smelser sounds a dominant note in his observation which concludes Chapter VI: "The appropriate research strategy at the moment, then, is not to encourage the development of more and more refined statements as to the conditions of post-attack society, but to encourage general research on a wide range of comparable experimental and historical situations so that our account of the effects of such a catastrophe can be built on a more solid empirical and theoretical foundation".[60] If the planner

[60] Above, p. 655.

demands knowledge of the degree of precision he feels he needs, he may be asking for what is unattainable, yet if he uses the knowledge that is available, he may feel that it lacks relevance or specificity.

A way out of this dilemma begins in a general recognition of what planning does. Even when a planner is given the mandate to plan for the most exotic futures imaginable, he is seldom instructed simply to "go out and think about the world". His planning task occurs while past decisions are being implemented in the form of present systems. It occurs amid budgetary and larger value constraints over which he may have no control. It occurs within a larger organizational framework, which institutionalizes a history of past successes and failures. It occurs within a set of explicit and implicit definitions about the proper scope of his agency's mission; these definitions are supported by constituencies inside and outside the organization. It occurs within the legacies of past commitments. Consequently, planners seldom approach the tasks of planning with an empty agenda. Their tasks may frequently be to maintain continuity or coherence of development in programs and systems; their tasks are less likely to require exploration of totally unknown country.

Therefore, planning frequently does not require a comprehensive, exhaustive view of the future as a basis for planning tasks. Only a partial view of the future may be necessary to keep the planning process going as a practical stream of events and decisions.[61] Even in the planning sector of an organization, numerous shorter term requirements can be met without a total view of the future. The need for only a partial view of the future may be used, of course, as a dodge to avoid attempting a comprehensive view of the future and to permit taking a

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[61] Particularly within a society founded on pluralistic, democratic values, a partial view may be more desirable than a comprehensive, exhaustive view, because the proper role of planning may be to create only the conditions for individual action in the future. See above, pp. 183-184. Of course, in the case of planning for nuclear disaster, it will be necessary for the planner to take a total view of the conditions for social life in industrial society, if he is to create plans for preserving domains of individual freedom. Here, he must distinguish between being analytically comprehensive and inclusive and overcommitting both plans and resources to the infeasible and undesirable goal of closely managing individual behaviors over the long term.

restrictive, agency-oriented view of what is required for the agency to survive in the shorter term as a self-interested group. But this immediate need for only a partial view of the future can be liberating, where the ultimate criterion of plans must be the total pattern formed by complex, interacting behavioral and institutional events and processes in an uncertain and inaccessible future.

In planning to reduce and manage the social effects of nuclear disaster, the uncertainty inherent in projections of the future is potentially devastating to a planner's sense of personal security and integrity. If too broad a definition of the planner's task is assumed, the price is severe: It might be necessary to try to describe the entire post-attack social world, if any work is to proceed. This analytic and empirical effort would quickly founder as a scientific enterprise, and the planner would despair of being able to be relevant and constructive. On the other hand, the recognition that he is not necessarily planning at the outset for managing the whole post-attack world may enable the planner to take a definition of his task which is ultimately more comprehensive than he might have been allowed if he had initially tried to grapple with all potentially relevant phenomena. In time, he may come to have a broader view of the post-attack social world than he initially might have expected to be feasible.

In showing how this might happen, it is useful to turn to those actual plans and systems which have dominated efforts to define the meaning of societal vulnerability and recovery. Central to these plans has been the concept of a system for sheltering the population from nuclear weapons effects.

Within the civil defense and emergency planning functions of government, the shelter concept carries with it a legacy of assumptions, commitments, and system elements which tend to define the characteristics of the post-attack world in the eyes of the planner. The purpose of the present discussion is not to examine this legacy, however; instead, the shelter concept will be examined as a concept around which a number of post-attack behavioral and institutional processes may be ordered. That is to say, the existence of a shelter system, as a system for ordering behavior, creates a number of ranges of post-attack behavioral possibilities. By studying these domains of behavior and institutional process, it may be

possible to understand more clearly not only the general consequences of any shelter system, but also the way in which positing a shelter system provides the analyst with coherent clues about the general properties of the post-attack social world. From these clues may come requirements for an unfolding chain of systems designed to manage post-attack social life more relevantly and more effectively. Ironically, the partial view of post-attack life implied in firm planning commitments to a shelter system becomes a point of departure for developing a more comprehensive view of the social processes which may unfold after attack and which may constrain attempts to adapt to the post-attack world.

It should be borne in mind that the purpose of this discussion is not to evaluate particular shelter systems or to sketch a complete post-attack social world. Nor is the purpose to attempt a rigorous insertion of the consequences of a shelter system into the various analytic schemes that have been proposed in this volume. Instead, it seems more useful to show how domains of post-attack behavior may be shaped by shelters and how, later, these domains are related to the emergence of other domains of behavior. From a study of these relations and patterns of dependence, new requirements for vulnerability-reduction and recovery-management systems can be derived. More generally, the analysis may show how a particular countermeasure system creates the conditions for a series of effects which are ordered by the basic levels of behavioral determinants in society. The resulting ordered series of social effects will form part of the post-attack social inventory which will be available for recovery efforts. Managing the processes which both define and limit this social inventory will be perhaps the fundamental task confronting planners and operational officials in defining systems to guide post-attack social life toward recovery.

Shelter Systems and Sequential Orderings of Post-Attack Behavioral Domains. The central proposition as well as central hypothesis of this analysis is that when the shelter concept is put in the form of an operating system, it will impose a characteristic sequence upon the systematic processes which order post-attack behavior and from which derive behaviors which will be of critical significance to planners. Other system concepts might impose different sequences and orderings of effects. In the case of the shelter concept, however, it will be suggested that for

each major phase of post-attack time, a characteristic level or combination of levels of behavioral ordering will set ranges and limits to the critical social effects of nuclear attack, and that these levels or combinations will conform to the total pattern outlined here. For each major phase of post-attack time, therefore, one or more of the major systems of behavioral ordering in society will be salient in characteristic ways to defining critical sequences of social effects to which planners must attend.[62]

The analysis of the processes of behavioral ordering which depend upon shelter systems begins in the analytic integration and application of several of the conceptual frameworks and paradigms which were outlined earlier in this volume. The new framework which results is given in Figure VII-2, p. 703.[63] Essentially, Figure VII-2 is a matrix formed in two dimensions. The horizontal dimension is post-attack time, composed of a sequence of post-attack time phases, which begins in Warning and Impact and ends in a broadly defined phase of Shorter Term and Longer Term Recovery. The vertical dimension is degree of situational dependence of the particular system or systems of behavioral ordering and specification which set ranges and limits to particular social effects at particular times. Within this matrix, it is possible to show how, at different post-attack times, different systems and levels of behavioral ordering in society establish the critical domains of social effects which both limit the specific consequences of a shelter concept and create the preconditions for later domains of critical social effects. In the form of a stepped progression of determinants (see Principle A. 4. above, p. 679 ff. and Figure VII-1a/1b above, p. 681), the effects within one domain will create the conditions for the functioning of other salient domains; at the same time, these effects will create specific conditions and linkages within specific, continuing processes which produce other specific effects later in post-attack time.

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[62] For definitions and discussions of the four major systems of behavioral ordering in society, see above, pp. 25-37, pp. 82-123.

[63] This Figure is the result of specific substitutions made in Figure VII-1a/1b above, p. 681, "Paradigm for a Stepped Progression . . . ". The axes of Figure VII-2 have two fundamental sources. The post-attack time phases are selected and combined from the possibilities presented in Figure Ia-1 above, p. 198, and the supporting text, pp. 195-201. The four behavioral systems and their basic array within the matrix formed by Figure VII-2 were originally outlined in Figure I-7 above, p. 111, and Figure I-8 above, p. 115.

Figure VII-2

RELATIONS AMONG DETERMINANTS IN A SEQUENTIAL ORDERING OF POST-ATTACK BEHAVIORAL DOMAINS: CONSTRAINTS ON A SHELTER SYSTEM

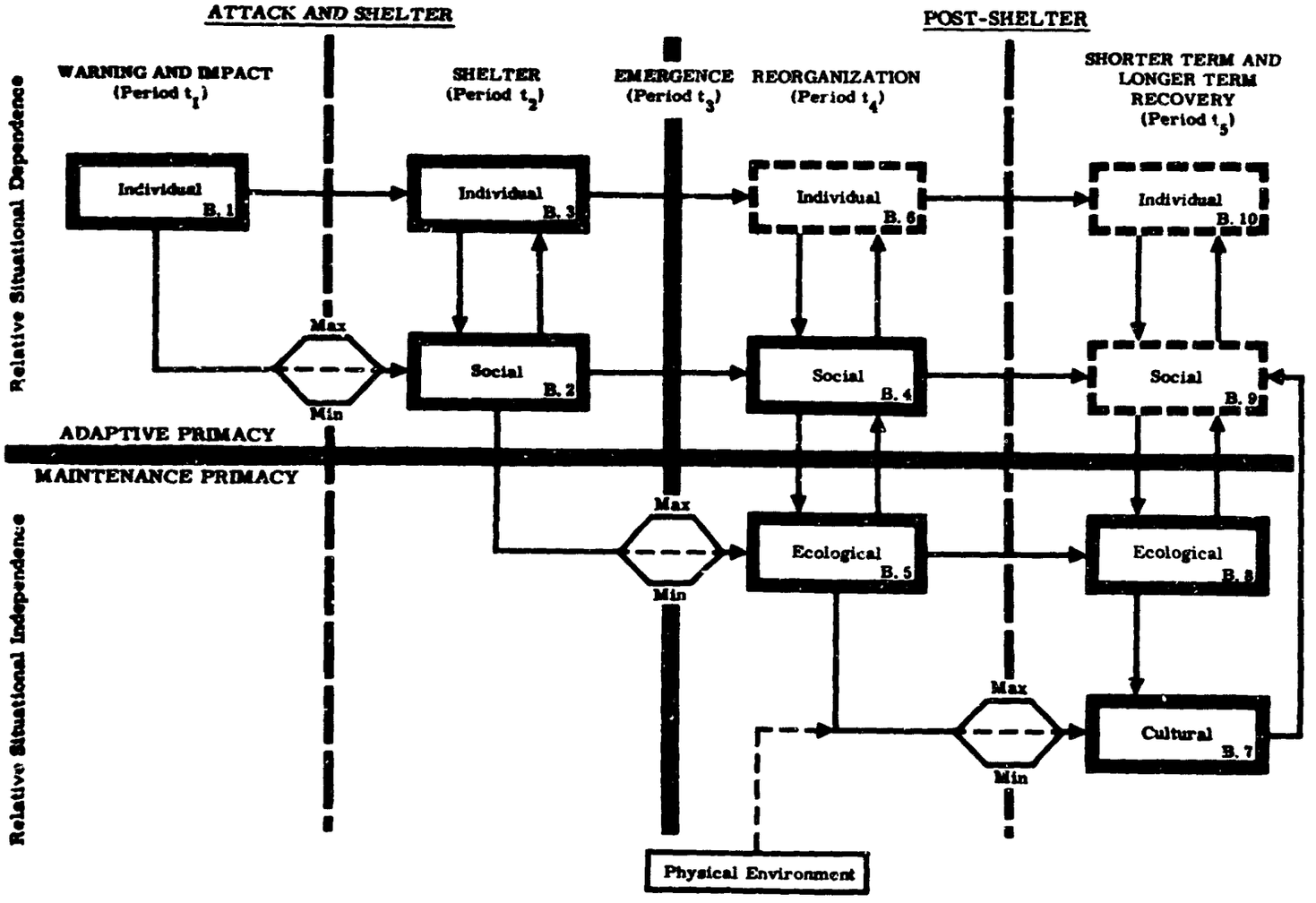


Figure VII-2 provides a concrete example of the specific ways in which attack effects will be translated into effects within the variety of levels of behavioral ordering which function in society. As with all social effects of attack, the social effects of attack influenced by a shelter system will begin in the immediate situation of action, with individuals responding to the demands of attack. As time progresses from Warning and Impact to the Shelter Phase, behavioral determinants at more complex levels of the social system are joined to effects which must be described on individual levels. This emerging, interactive pattern of effects creates the conditions for social effects within the post-shelter environment. Here, for the first time, domains of determinants and effects which are relatively less dependent on situation become of critical salience to the management of the social effects of attack. These domains are those of the ecological system of society. Finally, in later phases of post-attack time, that system of determinants most removed from the immediate situation of action becomes critically operative. Only in these later phases does the cultural system --- as a system --- become critically significant.

Figure VII-2 has been constructed so as to simplify the process of tracing the relations among the domains which sequentially order post-attack behavior and institutional processes. Before the detailed analysis begins, therefore, several of the simplifying devices should be noted and explained. First, to preserve the clarity of the basic metaphor of the "stepped progression", the dimensions of the matrix have been split into two equal parts on each axis. Thus, the post-attack time phases are divided into "Attack and Shelter" and "Post-Shelter" major phases, which appear graphically as of equal length. Within these halves of the total pictorial post-attack time representation are further differentiations, themselves indicated as equal intervals.[64] Obviously, in real time the Warning and Impact Period will probably be shorter than the Shelter Period, and these two Periods, taken together, will be shorter than the Post-Shelter Phase Periods. But the

[64] Except, of course, for the Emergence Period (Period t_3). For purposes of this discussion, this Period is treated as one of the boundaries between major groups of determinants and not as a separable phase within which major domains of determinants become salient.

empirical effects of the sequential orderings of determinants will not be altered by this analytic treatment of post-attack time as a succession of equal intervals arrayed within a basic "Shelter/Post-Shelter" distinction.

Similarly, the vertical dimension --- degree of situational dependence --- is not a continuum of equal intervals. All systems of behavioral ordering beyond the individual system and those visible systems of human interaction in immediate action situations are systems which must be described essentially analytically, even though they are real systems, whose existence can be inferred from empirical evidence. Thus, the progression from systems in immediate situations of action to systems relatively independent of action situations is not an empirical progression based on placement in an equal interval scale, but is, rather, a movement in analysis and description to different levels of behavioral specification and determination. But again, the purpose here is to suggest in the most general analytic sense how, as time lengthens after attack, new levels of behavioral ordering become salient to planning in regularly ordered ways.

Finally, it should be observed that the arrows which connect the domains in Figure VII-2 indicate causal sequences of critical behavioral and institutional effects. They are not meant to show all possible empirical or analytic relations that could exist among domains. For example, in the inventory to follow, it will be clear that perceived requirements for maintaining the viability of the cultural and ecological systems of society can influence actions taken in the Attack and Shelter Phase, although this phase is dominated by systems which are relatively situationally dependent and which are confronted with urgent requirements of immediate adaptation. In one sense, then, systems which are functionally salient later in post-attack time could influence behavior earlier in post-attack time. But this influence is done as part of a policy and planning process; it is not the result of behavioral determinants directly creating ranges and limits to critical adaptive responses in the immediate situation following attack.

Given these analytic tools and their necessary qualifications, it may now be useful to use Figure VII-2 to scan the sequences of post-attack behavioral domains which rise to critical salience for planners as a result of the effects of a shelter system.

An Inventory of Findings and Hypotheses About Possible Behavioral and Institutional Effects of Shelter Systems in Post-Attack Society. As with the analytic principles given in the previous section of this Chapter, an attempt will be made here to show the status of each of the following propositions as an item of knowledge about the real world. The discussion following each proposition will not be as detailed as that given under the analytic principles, however, since the function of these propositions is, wherever possible, to report and summarize specific, empirically based findings and hypotheses. The principle documentation for these findings will be in footnote references to previous parts of this volume. Furthermore, it will be assumed that the reader is generally familiar with the analytic perspective which has guided the total organization of this volume.[65]

The propositions presented here unfold in the same order as the domains of determinants portrayed in Figure VII-2. The reader will note a key number in the lower right-hand corner of each small rectangle which shows the analytic placement of a domain of behavioral ordering in that Figure. This key number is the number of the proposition or group of findings given here which details critical post-attack events in that domain. By following the sequence of this inventory, from B. 1. to B. 10., the reader will be moving from Warning and Impact to the later phases of Recovery, and from the Individual System to the Cultural System of behavioral specification, before working back once more to the Individual System. On the border of each major post-attack time phase, the reader will observe that the arrows signifying movement from behavioral cause to behavioral effects splits when the analysis moves to a new level. This split and the peaks denoted "Max" and "Min" portray graphically an hypothesis which will be outlined in the inventory: that in moving from one to another major level of behavioral ordering, across the boundary of a period in post-attack time, there are Maximum and Minimum ranges of behavior and institutional process which limit the translation of social effects to new levels of behavioral ordering. Effects falling outside these limits will hinder not only the process of translating effects but, much more importantly from a practical point of view, the capacity of the survivors of the society to enter later phases of post-attack time.

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[65] The Appendix to Chapter I, pp. 185-203 above, reviews this analytic perspective and the total organization of the volume.

Finally, in referring to this inventory, the reader will note that the format of each major proposition or propositional group leads from a general statement toward a particular finding, and that it sometimes concludes with a specific statement of a requirement for a new system to manage a particular social effect of nuclear disaster.

B. 1. The Individual System in the Warning and Impact Period. The primary purpose of a shelter system is to protect individuals, and it will be the behavior of many individuals in many concrete situations of action which determines whether future capacities for behavior and behavioral ordering in other domains will be brought into shelter environments.

B. 1. 1. Panic. Under existing conditions of sudden warning and shelter-taking, mass panic is more likely than it would be if specific steps were taken to reduce the possibility of a classic conjunction of factors conducive to panic during the Warning period. But unless specific conditions conducive to panic do occur during the Warning and Impact Period, panic is improbable at that time. It is even less likely later in post-attack time.[66]

B. 1. 1. a. Planning Requirement. As part of future warning and movement-to-shelter systems, elements must be incorporated which will define the danger accurately and establish procedures for orderly queuing in the physical movement of persons to shelter. These elements will be part of not only physical shelter systems (as in, for example, the design of entrances) but perhaps more importantly, part of larger systems of communication and control in mobilizing and directing a civilian population. These elements must have capacities for compensating for the varying degrees to which different sectors of the population will be familiar with Warning and able to enter into a coherent movement to shelter.

B. 1. 2. Post-Attack Demography. The capacities of individuals to attend to warning and move to shelter will partly determine the post-attack population characteristics of the society. Individuals in shelters constitute, in the aggregate, a population with specific categories of characteristics as a population. These characteristics do not become operative as constraints upon survival or recovery until later in post-attack time, unless there are specific

[66] Above, pp. 225-232, pp. 611-617.

B. 1. 2. deficiencies of critical skills required to organize and maintain shelters, among those groups taking shelter. In the event of a massive attack directed against the whole society, the aggregate characteristics of the population within shelters will probably be indicators of the fundamental demographic constraints upon recovery in the ecological system.

B. 1. 3. Hypotheses on Maximum and Minimum Behaviors in Movement to Shelter. For effective movement to shelter, the minimum behavior required is effective attention to Warning, followed by willingness to accept control and direction in the shelter-taking process. The maximum behavior tolerable is a state of arousal and effective mobilization and movement just short of panic. Acts of individual behavior in either direction beyond these limits can result in the loss of the affected population, and if this loss is on sufficient scale, the subsequent analysis becomes an empty exercise.

B. 2. The Social System in the Shelter Period. Within shelters, the critical domain of behavioral determinants for survival is to be found in the capacities for individuals to organize and participate in coherent patterns of social interaction. In short, the social system emerges as critically salient to negotiating the Shelter Period. From Warning and Impact, individuals enter with histories of social relations and capacities for them. These histories and capacities are the vehicle through which social system determinants of behavior are translated into the shelter; the social system requirements of living in a shelter will force the mobilization of these histories and capacities.

B. 2. 1. Functional Requirements of the Shelter Social System. The social system of the shelter must be so organized as to allocate physical necessities and life conditions harmoniously and according to real requirements; care for the injured, ill, and dying; cope with emotional requirements of survivors; disseminate needed accurate information about the present and future; and both prepare for and control emergence in the post-shelter world.[67]

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[67] Above, pp. 232-244, pp. 621-630. These specific organizational requirements have been recognized in such publications as Ada S. Brandegee and Emil Bend, Shelter Manager's Guide: Volume III of Integrated Guidance for Shelter Management (Pittsburgh, Pa.: American Institutes for Research, Institute for Performance Technology, June, 1965 --- "Prepared for Office of Civil Defense").

B. 2. 2. Convergence Phenomena. Among any population outside the impact areas, there will be presures to converge on impact areas, to explore what has happened and to provide assistance. [68]

B. 2. 2. a. Planning Requirement. It is convenient to assume that organizational capacities to limit access to contaminated areas will exist. Under conditions of massive disaster and disrupted communication and control procedures, will this be true? (See, for example, A. 5. above, p. 685 and the supporting discussion, pp. 685-688). If this is not true, planners will need to know the future relations between attempts to control non-impact population survivors and other demands on organizational and management resources following attack.

B. 3. The Individual in the Shelter Period. The ability of the individual to adapt to the shelter will be significantly determined by the ways in which he enters the social system of the shelter. If his capacities for adaptation are too limited, he will either perish in the shelter or leave the shelter as a specific set of problems with which institutions of social control must deal. On the other hand, with adaptation to the shelter environment, the individual becomes a specific member of a specific group organized to survive into later phases of post-attack time. Analytically, capacities of particular individual systems will determine the kind of social system which emerges in the shelter and perpetuates previous social institutions; reciprocally, the social system of the shelter directly meets problems of individual adaptation to attack effects.

B. 3. 1. Meeting Individual Needs. Beyond physical needs, the individual will have a number of emotional needs which must be met. These include especially coping with death, feelings of grief, and with visible disorganization of behavior patterns governed by valued institutions. These needs may emerge as early as the Shelter Period, but they will continue after leaving the Shelter. [69]

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[68] Above, pp. 239-244, pp. 626-630.

[69] Above, pp. 244-251, pp. 631-636.

B. 3. 1. a. Planning Requirement. In the pre-attack world, it may be stressful to consider measures for coping with such needs as widespread grief and the sense of loss of valued social ties. Nevertheless, planners will need to consider the resources which they will have for meeting these needs, which may arise as early as the Shelter Period. In particular, areas of the voluntary sector of society which have hitherto been "taboo" as subjects for post-attack social resource planning may be among the most important social sectors which planners should try to mobilize. These areas include especially religious organizations, patterns within ethnic communities, and kinship networks. Proper use of such social resources may reinforce and maintain desirable consequences of the phenomenon of the "therapeutic community".[70]

B. 4. The Social System in the Reorganization Period. Because this inventory deals especially with general relations among the consequences of shelter systems, there is no necessary violation of logic in moving under category B. 4. directly to the social system in the Reorganization Period, even though the domain of most critical salience to planning in the Reorganization Period is that of the ecological system. Indeed, to understand why the ecological system is ultimately so critical during Reorganization, it is helpful to look first at the social system during Reorganization.

In the Reorganization Period, the social system will be salient to planning on two levels. First, the social system of the Shelter Period must be transformed into more complex, less constricted patterns of living during Reorganization. For the sheltered population, there must be a crucial transition between living in shelter and resuming the social patterns of industrial society. Second, critical processes which must occur on the level of the ecological system during Reorganization must depend upon capacities at the level of the social system to create patterns of resource allocation and division of labor. Upon the capacities for social structural reorganization which emerge from the total social system (both sheltered and non-sheltered) of the Shelter Period will depend the most critical solutions to problems of maintaining the ecological system.

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[70] Above, pp. 248-251, pp. 627-632. See also Footnote 81 to Chapter I above, p. 93.

B. 4. 1. Translating the Social Systems of the Shelter Period into Structures Required for Reorganization. The basic functional challenge to the social system which emerges from the Shelter Period is to convert behavior patterns which were required for survival in the short term to behavior patterns required for reconstruction. The need for this broad structural transition can be expected to create a number of critical patterns of conflict. These will include demands that executives replace heroes, that local communities defer claims based on special feelings of deprivation, that individuals continue to accept burdensome personal obligations after the most vivid crisis mood has dwindled, that pre-attack systems of reward and status be reinstituted in the face of radical differences in the effects of attack on individuals, and that the government allow latitude for dissent amid conditions that may require attempts at social and personal control of individual lives which go far beyond previous experience.[71]

B. 4. 1. a. Planning Requirement. It is in dealing with these general problems of social system transition that planners are forced, for the first time in this analysis, to confront the question of whether they can guide the general process of restoring a total set of social structural conditions for complex society. Part of the solution to this question will depend on the extent to which they have had possession of facilities for rapid information processing, communication, and control during the Shelter Phase. But part will depend upon whether planners can develop --- and, ultimately, gain acceptance for --- social criteria with which they can approach a number of interacting social system problems and transitional conflicts. These efforts to develop criteria will probably start in the economic sector of the social system, as planners and administrators develop specific measures for compensating losses and assigning labor to critical sub-sectors. From these economic criteria will come pressures for developing broader criteria for managing patterns of relations within the total social system.

[71] Above, especially, pp. 251-256, pp. 636-638. On a particular problem which may be of great consequence for both the Shelter Phase and the Reorganization Period, see Smelser's discussion, "Theoretical Refinement: The Assessment of Role-Conflict and Its Consequences in Post-Attack Society", above, pp. 644-650.

B. 4. 2. Economic Viability and the Social System. Assuming that the sheltered population had sufficient stocks for short term subsistence and that non-impact area members of the society had access to similar items, the beginning of the Reorganization Period marks the beginning of the most urgent economic requirement of post-attack society: the need for production to recover to "a level adequate to support the survivors before the grace period afforded by surviving inventories comes to an end".[72] If this need for viability cannot be met, the human population which forms the basis for the ecological system of society cannot survive in a form which will meet the requirements of industrial society. To meet the requirements of viability, the economic sector of the total social system must be organized to meet needs for capital, labor, food, and the social processes required to combine them into a viable economy. Particularly under conditions of massive attack, this may require attempts to manage institutional patterns outside the specifically adaptive sector represented by the economy. The political and voluntary institutional sectors of the social system will be especially affected. The political sector of the social system will be subjected to pressures for decisions regarding the allocation and management of basic categories of resources required in the race for economic viability; the voluntary sector of institutional ife may be redefined in part, as economic demands both draw individuals away from voluntary participation (including familial and kinship ties) and create pressures to utilize voluntary patterns in sustaining the effort to achieve economic viability.

B. 4. 2. a. Planning Requirement. It is in the management of attaining economic viability that the Office of Emergency Planning has one of its largest potential responsibilities. In creating the conditions within the total social system which will permit effective economic management, the role of the Office of Civil Defense has remained undefined. Yet in managing the transition from shelters to the social system which will form during Reorganization, the most significant human as well as material resources may be those remaining in shelters. Two broad problems for planning appear to result. First, what

[72] Sidney Winter's words, above, p. 452. B. 4. 2. is drawn largely from his earlier discussion above, pp. 387-435.

B. 4. 2. a. is the management responsibility in redefining the social systems of the Shelter Phase to meet the tasks of attaining viability which will be levied upon the social system during Reorganization? How early in post-attack time does it begin? Second, how do the social management responsibilities which might be assumed by the Office of Civil Defense affect the economic management responsibilities within the jurisdiction of the Office of Emergency Planning and the Executive Office of the President? What are the interrelations among these responsibilities, over time?

B. 5. The Ecological System in the Reorganization Period. During the Shelter Period, it was necessary for individuals and their social system to meet urgent requirements to adapt to the effects of attack. The shelter system made it possible for those in the impact area of attack to subsist; similarly, those not in shelters and outside impact areas subsisted as part of a society whose basic internal patterns had been fragmented and blocked. During the Reorganization Period, however, a number of deferred problems become pressing. These problems arise because of the fundamental shift that occurs upon emergence from shelters. The problem is no longer that of making immediate adaptations to attack effects and of surviving. The fundamental challenge to both survivors and their social system is, instead, creating the conditions for maintaining themselves as society. This will require a number of specific, critical tasks of adaptation and maintenance; the critical level of behavioral ordering which determines the ranges and requirements of these tasks will be the ecological system, a system whose primary function is maintenance and a system which is relatively independent of immediate situation.

Of course, the instant the total number of attack survivors and their demographic characteristics can be determined, the planner will know the composition of the post-attack population. Furthermore, the physical environment in which this population must function during Reorganization will be determined during Warning and Impact and the subsequent, directly related events. As a system, however, the human population in its physical environment does not exist as a domain of behavioral determinants until emergence from shelter, and until the tasks of reorganization have begun in the post-attack social and physical world.

Without a self-maintaining population which possesses the traits required to support a complex, industrial society, longer term processes of reorganization and recovery cannot be

B. 5. maintained. The use of social system resources surviving from the Shelter Period for creating and attaining ecological stability therefore becomes the dominant functional requirement in building a basis for a self-maintaining population in the Reorganization Period; individuals in a social system are the basic "resources" which must enter the functional processes of the ecological system.

B. 5. 1. Population Characteristics Required for an Industrial Social System. Using certain relatively low levels of attack (i. e., 1, 466 and 1, 779 megatons --- see above, pp. 288-289) as the basis for projections, the proportional losses among the highly educated and among those with professional, managerial, and technical skills critical to maintaining an efficient division of labor in industrial society appear to be not as substantial as it was once thought they might be, although under higher levels of attack, these losses might increase.[73] On the other hand, using even low level attack assumptions and certain reasonable models, the dependency burden in society appears to shift radically: "Following the Holifield attack, up to 17 percent of all married persons might be widowed and up to 26 percent of all children might lose one or both parents (8 percent losing both parents and 9 percent each losing mother or father alone). Following the Spadefork attack, the proportions widowed and orphaned would be smaller but still of substantial magnitude".[74] In maintaining an industrial society, therefore, the first population problem may be not so much that of insuring that certain critical resources survive in particular persons or of compensating directly for this category of losses, but more that of dealing with maintenance burdens created by changed social relationships, so that survivors needed to restore the effective division of labor and patterns of communication, command, and control can be freed for critical tasks.

B. 5. 1. a. Illustrative Planning Requirement. Consider as a type case the problem of child care in post-attack society, where there are large numbers of orphans and heavy demands on individuals of motherhood and fatherhood ages to increase their participation in economically productive tasks or

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[73] Above, pp. 297-310.

[74] Above, p. 295.

B. 5. 1. a. in patterns of general social support. Clearly, normal family patterns will be insufficient to support this dependency burden. What social resources are available to the planner? A system of child day-care centers may seem attractive --- but could organizational and material resources be directed to such a system? When would the children enter? Would such a system be desirable and acceptable within the framework of American values?

Possibly orphans could be placed with kin. Since kinship ties appear more widely spread in American society than has usually been thought to be the case, it might be possible to consider allocating orphans among kinship networks in which they have places.[75] To develop such an allocation program, it would be necessary to establish the locations of kin to whom orphans could be allocated. A rather ambitious program could result, in which each child below a given age would have several alternative kin identified before attack, with one of whom he could be placed in the event he became an orphan. Under certain circumstances, the kin-group member with whom the child is placed might receive subsidy or compensation, as part of the claims which he laid before the government's system of damage compensation.

Exploring the ramifications of such a Placement Program may inform post-attack system planners about the kinds of requirements which must be met if burdens are to be removed from population sectors critical to reorganization and recovery.

B. 5. 2. Population Demands on the Social System. While the population system must be available to provide labor to the social system engaged in control of Reorganization, the social system must meet the subsistence needs of the population. As has already been shown, this especially includes production of the material resources needed to meet the requirements of physical survival, before

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[75] See Footnote 21 to Chapter III above, pp. 295-296, and Footnote 81 to Chapter I above, p. 93.

B. 5. 2. inventories carried over from the pre-attack period are exhausted. (See B. 4. 2. above, p. 712). But this also means that in the longer term, patterns of social organization must be found which permit couples to continue to bear children. Furthermore, in the several weeks after emergence, the social system must meet the organizational requirements for controlling an altered physical environment, in which the population system of society must live. For the human population and its forms of social organization, one of the most salient features of this post-attack physical environment will be re-establishing control over disease vectors, whose effect had been suppressed as a result of ecological equilibria established by the pre-attack society.[76]

B. 5. 3. Hypotheses on Maximum and Minimum Behaviors in Moving from Immediate Adaptation to Attack to Establishing a Stable Ecological System in the Longer Term. In creating the conditions for a stable ecological system, the minimum behavior required will be organization of the conditions for economic viability and physical safety in the physical-biological environment. At some point following the establishment of these minimum conditions, the probable post-attack drop in the number of childbirths can be gradually restored, although this full restoration could conceivably take at least five years.[77] To speak of the "maximum behavior tolerable" in this transition, it is necessary to see, first, that various combinations of social policy and resources might attain the minimum conditions of ecological system and environmental stability. Within this range of possibilities, pressures will certainly exist to avoid overdetermining the acts and lives of individuals. Planners may expect

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[76] On the possible post-attack incidence of epidemic diseases in the United States, see Engineering-Science, Inc., Postattack Sanitation, Waste Disposal, Pest and Vector Control Requirements and Procedures (Arcadia, Calif.: Engineering-Science, Inc., February, 1965 --- "Prepared for Office of Civil Defense"). A detailed analysis of one aspect of this problem will be found in H.H. Mitchell, Plague in the United States: An Assessment of Its Significance as a Problem Following a Thermonuclear War (Santa Monica, Calif.: The RAND Corporation, RM-4968-TAB, June, 1966). Vector control must begin, of course, during the Shelter Period, but it will expand as a problem of both technology and organization in the Reorganization Period. Part of this expansion of the problem will be a simple function of the time required for uncontrolled disease vectors to become manifest in their effects.

[77] Above, pp. 311-313.

B. 5. 3. a tension between this pressure and the requirements and controls for maintaining especially the social organization which underlies the restoration of a stable and growing population. Therefore, the "maximum behavior tolerable" is the latitude for freedom which social institutions operating during Reorganization can allow without disrupting the behaviors required to maintain stability and reorganization in the domains controlled by the ecological and social systems. A precise definition of "maximum behavior tolerable" would depend upon the nature of acceptable and enforceable goals which planners have set above the minimum requirements for viability and stability.

At this point, the concepts of Maximum and Minimum have shifted somewhat. Minimum remains a behavioral concept; to fall "below" the Minimum is to lack the capacity for taking those acts required to stabilize the ecological system. By contrast, Maximum is an institutional concept, which depends in part upon the values governing attempts to achieve ecological minima.

B. 5. 3. a. Planning Requirement. Within the social criteria guiding Reorganization (see B. 4. 2. a. above, pp. 712-713), it may be necessary to state a number of policies and standards with which post-attack administrators can guide the restoration of desired levels of population size, composition, and rate of growth. [78]

B. 6. The Individual System in the Reorganization Period. As suggested by a dashed boundary in Figure VII-2, the Individual System declines as a critically salient domain of behavioral ordering in the Reorganization Period. Obviously, individual needs and requirements will be manifested --- the whole point of many of the institutional arrangements that must be made during this period will be to meet individual needs. For planning purposes, however, the important domains of behavioral ordering will be those of the social and ecological systems, particularly as the shelter experience has affected the availability of resources to meet requirements on these levels.

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[78] On these three dimensions of population as dimensions of recovery problems, see Chapter III above, especially pp. 281-282, pp. 310-311, and pp. 316-317.

B. 7. The Cultural System in the Period of Shorter Term and Longer Term Recovery. Elements of the cultural system of the society will affect behavior at all times following attack. Indeed, starting within shelters, the population may be rallied in terms of shared values, which can be evoked intentionally or unintentionally. Many of the decisions which must be made before attack by planners and after attack by operators will be assessed against cultural norms. As a unified system of values, symbols, meanings, and behavioral prescriptions, however, the cultural system does not become critically salient to planning until the period of Recovery gradually begins. Then, the effects of the total set of responses made by different levels of the social system to attack can be discovered and assessed, as they have worked to redefine the cultural system. This will occur as political dialogue is restored; possibly, this process may begin in value conflicts over the degree of government involvement and institutional mobilization in post-attack society.[79] In any event, a "regressive" cultural state is unlikely.

The critical function of the cultural system within society in the Recovery Period will be as an arena for defining the meaning of the nuclear disaster on society and for finding acceptable, long term policies which can guide the society that now exists. One of the hallmarks of the salience of the cultural system will be that the management of the social effects of nuclear attack will be increasingly defined in terms of larger values and the social institutions for both supporting and modifying them. As values and meanings instead of urgent functional requirements for survival increasingly define the directions social processes take, the planners and emergency administrators increasingly hand over their functions to the conventional agents and processes of social decision.

B. 7. 1. The Cultural System and the Rate of Recovery. The values and ideologies, general skills and perceptions in a sophisticated labor force, and technological knowledge which are prerequisites of rapid economic growth

[79] The evidence on this possible conflict is only speculative. See above, pp. 259-260, and Howard Swearer's extensive discussions of the tensions between values and social policy in industrial social systems, in Chapter V. And see Winter's discussion of desirable economic policies, pp. 419-435.

B. 7. 1. will probably survive nuclear attack and continue to be capable of being effective determinants of behavior. The issue is not whether these cultural elements will continue to exist but how they will be mobilized. [80]

B. 7. 2. Pressures on Values. On the other hand, particular demands may create particular pressures on valued standards. In considering how resources might be allocated to achieve economic viability, it is clear that there could be a marked drop in per capita consumption levels without reaching the level required for "subsistence". [81] Another kind of pressure will result from needs to change social institutions, as might be implied, for example, in the kinds of arrangements for placing orphans that were considered above, in B. 5. 2., pp. 715-716. These arrangements would recognize that traditional patterns of child nurturance and child support would not be continued for many children in post-attack society.

B. 7. 3. Hypotheses on Maximum and Minimum Conditions for the Salience of Cultural Determinants. For cultural determinants to be minimally relevant, they must have had sufficient flexibility to define and legitimize the necessary institutional adjustments that were required to achieve the stability of the ecological system of society. Without that capacity, the cultural system of the society will come under fundamental challenge. On the other hand, the social resources available for longer

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[80] Above, pp. 256-260, pp. 638-643. See also A. 1. above, the "Axiom of the Persistence of Determinants, p. 665 and its discussion, pp. 665-667

[81] Above, pp. 408-412. But there are distinctively economic requirements which appear to limit the extent to which per capita consumption can actually decline even though there might be great tolerance within the culture for a substantial drop. Winter qualifies his analysis at one point by observing: "It is important, however, to examine the relevance of an argument that would relate the subsistence standard to present standards in underdeveloped countries, or in the United States a century or more ago. According to this standard, the required consumption expenditures per capita might be a tenth or less of the present level, rather than a third or more as assumed here. A decline in consumption expenditures of this magnitude would involve a reversal of the historical process by which the production of food has come to require a smaller and smaller fraction of the economy's total resources --- a reversion to a situation in which the fraction of the labor force employed in agriculture was over 60% as against the present 6%. Per capita expenditures on food would have to decline by something over 50%, but this decline would primarily take the form of reductions in processing, transportation, and distribution". Above, p. 409.

B. 7. 3. term recovery from earlier periods of post-attack time may have required shifts in elements of the cultural system which passed the range of maximum flexibility. Beyond this range, a distinctively different set of cultural elements may be at least analytically perceivable. From these changed elements may come individual or institutional pressures to change other parts of the cultural system.

B. 8. The Ecological System in the Period of Shorter Term and Longer Term Recovery. Within the time periods following Reorganization, problems of the ecological system will probably continue to require solutions in terms of the cultural system. By the time the lengthening period of Recovery has begun the minimum conditions for ecological stability will have been attained. The ecological "problems" that will continue to require resolution in cultural terms will probably be --- insofar as it is possible to speculate about this period on this level --- resistances to the institutional adjustments that had to be made to achieve ecological stability. These resistances may be manifested particularly by individuals who resent the controls on personal and family behavior required to achieve economic viability and ecological stability. If the ecological system still appears precarious in the years of Recovery, appropriate policies for dealing with this situation will be debated in the political sector of society. Particular measures for correcting this situation may be devised to deal with this situation at the level of the social system.

B. 9. The Social System in the Period of Shorter Term and Longer Term Recovery. As is indicated in Figure VII-2, it is assumed that by the early months of Recovery, the social system will be less salient as a system for planner's concerns. At the same time, the social system could leap to salience because of the analytic relations between it and the cultural system. In defining and ratifying the social changes created by the stepped progression of events following attack and shelter, new social relations and new social roles may be created among individuals. Particularly if the ecological system fails to stabilize and recover at desired rates, pressures will be created for new social arrangements to increase these rates. The conception of what are desired rates of recovery is ultimately a reflection of cultural values, but attaining these rates will be a matter of creating arrangements in the social system which will allow them to be attained. In particular, measures for increasing the birth rate and raising the level of skills in the population must be accomplished on the level of the social system.

B. 9. It is in considering the relation between the social system and the cultural system during Recovery that the critical salience of the cultural system to planning may be understood more clearly. It is within the framework of cultural values and definitions that the ultimate meanings of the experience of nuclear disaster must be understood and accepted by the population. Yet the cultural system does not directly influence the ecological system, where the effects of attack may be visible for generations and may require very long term investments in compensatory measures and institutional changes. To deal with deficiencies in the population base of the society, or with its physical environment, it will be necessary to find culturally acceptable definitions and goals, which must then be converted into social system characteristics, which in turn can alter both population trends and particular conditions of living within the social system.

B. 10. The Individual System in the Period of Shorter Term and Longer Term Recovery. Increasingly, the individual will be resuming a normal life pattern. Insofar as he retains needs and claims resulting from the experience of nuclear attack and disaster, these will be treated according to regularized principles, which may be scrutinized from time to time in terms of the emerging cultural definition of what happened to him. As an individual human being, he may be haunted from time to time by the imagery of tragedy As a subject for specific planning and management, however, the individual system is relevant only insofar as he is legitimately the continuing object of social concern, through policies which pertain to particular traits which continue to be officially salient.

Maximizing and Managing Options for Using the Post-Attack Social Inventory, Within a Moving, Unstable Social Equilibrium System. The immediately preceding inventory of findings is primarily illustrative, even though it is certainly intended to show relations among a number of what appear to be the most suggestive findings of this volume. Nevertheless, an examination of the sequential orderings among the post-attack behavioral domains described by this inventory reveals a number of recurrent processes and steps:

(1) At each major boundary between post-attack time phases, there appear to be critical ranges within which behavior or institutional processes must fall, if the next level of behavioral determinants is to become effective and if the next major phase of post-attack time is to begin.

(2) The shelter concept appears to create a characteristic sequence of these critical ranges.

(3) For each major transition between levels of behavioral ordering and within each major phase of post-attack time, the shelter concept will create a number of particular characteristics and functional problems among the surviving population.

(4) From these characteristics and as a result of particular solutions to these functional problems of adaptation or maintenance, come the basic social resources which will be mobilized in the next period of post-attack time. These resources are centered in specific traits and capacities of individuals, as ordered or defined by varying levels of behavioral determinants.

(5) For every major behavioral domain and for every post-attack time period, there appear to be specific, critical decision points for which planners must prepare criteria to guide allocating and controlling the available social resources. A number of these decision points were suggested or implied in the preceding inventory.

(6) As a total system, post-attack society can probably be managed only through particular domains and particular ranges of critical decision and control. Thus, there are inherent indeterminacies in the relations among various programs, policies, and countermeasure systems for managing the sequences of social effects. At any point in post-attack time, the administrator may confront a variety of possible relations among systems and effects and a variety of possible allocations of social resources. In sum, he will have varied options and ambiguous sets of total criteria.

If these general processes and steps are viewed within the basic social system metaphor of this volume, it is possible to propose a general restatement of the central problem confronting planners who would devise systems for managing the social effects of nuclear attack. The restatement begins by noting that nuclear attack is a marked intervention in the social processes of complex society. In the rhetoric of the system metaphor --- this attack disrupts the stable equilibrium among social processes which had been achieved by the self-maintaining society

before attack.[82] The general effect of the attack is to create a series of demands on the total system formed by society. Because of the damage and the interacting demands created by attack, the total social system is now unstable, in that failure to meet a series of critical and immediate functional demands could result in the loss of the ability of the society's members to maintain the society with its pre-attack characteristics. Attack has created a moving, unstable equilibrium, with inherent potentialities for social disintegration. Ultimately, the society could fragment and decline, losing the characteristics of complex social differentiation which form the basis for industrial social processes. While the empirical conditions of such a decline are not clear at present, the system metaphor opens it as at least an analytic possibility.

The fundamental challenge to the pre-attack planner and post-attack operational official will be to define the critical social resources at his disposal and to combine them to restore a stable social equilibrium in which valued characteristics of society are preserved. The empirical and policy difficulties make this task of definition and combination enormously difficult. The basic conditions for societal equilibrium are not understood fully. Even if they were, it is probable that the planner would have a number of possible options for combining social resources. He must then be guided by social values and social policies, some of which may be difficult to articulate at any time before or after a nuclear attack. But even if they could be defined, the planner and operator would confront staggering practical problems of implementing many particular decisions which are designed to achieve control over critical ranges of post-attack behavior and institutional process.

A realistic general planning and operating strategy would be, then, for the post-attack planner to try to create a broad range of opportunities within which the

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[82] The basic definition of society used here was given above, p. 83; "A society is a self-maintaining human population in relative equilibrium with its physical environment, sharing a common cultural system for defining values, existential realities, and symbolic modes and inhabiting a geographical area which is recognized as being 'legitimately' the territory of the population. The society endures over more than one generation, and its institutions provide for this intergenerational continuity and for the organization of social action among the members into stable patterns which meet the requirements for maintaining the population in the present generation".

post-attack operator can try to use particular options created by particular social resources for affecting critical social processes and meeting critical functional problems following attack. Guided by a generalized and ambiguous notion of what might be required to restore the various preconditions for particular processes within the social equilibrium, the planner and operator can equip themselves to meet only particular sequences of particular events and problems. In trying to do this, they will be grappling partly analytically, partly intuitively and pragmatically, with the problems of controlling the moving, unstable social equilibrium created by attack.

Even this highly generalized statement can be seducing. After all, it is based on a metaphor which refers to a unified set of dynamic social processes. It is only a step to saying that the problem is one of controlling the total equilibrium process following attack and that, therefore, there should be a unified vulnerability-reduction and recovery-management system. In the face of the personal as well as social challenge created by planning for nuclear attack, the planner will need to recall the distinction between the analytic and the empirical. He must retain whatever powers analytic tools provide him, without being seduced by them. At the same time, he must try to create means for enhancing his empirical control over a wide range of events and demands, without losing his confidence in the powers analytic tools can provide him in taking first steps to understand and control processes of seemingly intractable complexity.

The Question of Social Costs

In spite of the uncertainties inherent in the criteria used to define and deal with the social equilibrium, enough may have been said to show the kinds of social costs created by a nuclear attack. In many instances, these costs are difficult to express in strictly economic terms. This may be one reason why, from time to time, there may be temptations to rely upon private theories and private assumptions about how Americans would behave under nuclear attack. These private theories and assumptions provide shortcuts around the kinds of analyses undertaken in this volume.

Within this Chapter, however, some first steps have been taken toward creating models within which social costs can be considered as they affect particular planning problems. Central to these first steps is the analytic principle which holds that post-attack social effects and processes move through a series of interdependent, sequentially ordered steps, from one period of post-attack time to another. If this principle is true to reality, then the central social costs of nuclear attack which planners must consider in trying to reduce vulnerability and enhance recovery prospects are those effects of attack which block or interfere with these processes of time-dependent behavioral ordering. Conversely, a particular system will be judged by its measurable ability to reduce and control these effects. The first uncertainty in trying to decide on the merits of a particular system for controlling these effects lies, therefore, in the inability of the analyst to say at present whether a particular system would deal with all the relevant effects in the ways claimed for it, and thereby create behavioral and institutional conditions for later sysfems to exploit. Future attempts to create a basis for evaluating vulnerability-reduction and recovery-management systems in an analysis of the social effects of nuclear attack must continue to refine these questions and try to create methods for answering them.

The necessary uncertainties about particular systems effects only reflect the difficulties analysts have describing the precise ways in which specific social effects are critical to the survival of society as it is presently valued by its members. For this reason, analysts must try to equip planners to spot the general ranges within which post-attack operators must have options for managing social resources to meet unexpectedly critical contingencies. Therefore, systems will also be evaluated in terms of their abilities to create a variety of potential combinations of social resources, to reduce a range of potential social costs.

As is evident once more in this brief discussion of social costs, in needs to evaluate potential operating systems as well as to assess the general requirements for the survival of American society, the study of the social effects of nuclear attack emphasizes the urgent need for theories and models which will increase analytic control over the dynamics of social systems. In national security planning, the need for such tools exists now, while the ability of social analysts to provide

these tools depends upon steps which have yet to be taken in the social sciences. For this reason, the social analyst has a continuing responsibility to show the planner the limits of the tools available. Sometimes this will seem to thwart the urgent demands of planners for more adequate tools upon which to ground their thinking. The planner must realize, however, that by being tentative in his claims, the social analyst is doing his duty not only as a scientist but as a citizen. At the same time, there remains an ample range within which social analysts can dare to extend their tools, in the service of their nation's security.

13. ABSTRACT (Continued)

psychological dimensions of nuclear attack, demographic effects and population recovery problems, economic recovery after nuclear war, political-administrative dimensions of nuclear attack, and the use of especially the comparative method of social analysis as a tool for developing knowledge about societal vulnerability.

In the third and final Part of the book, the editor traces a number of ways in which the social dimensions and domains of nuclear attack indicate problems for planners and administrators. The fundamental problem of social planning to reduce societal vulnerability is to understand and control the unfolding of what can be conceived as characteristic, time-dependent, sequentially ordered progressions of social attack effects. Management of these stepped progressions of social effects appears to require a society-wide analytic framework and the ability, in practical systems design and operations, to deal with events occurring within and affecting the entire social system.

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13. ABSTRACT

In order to provide planning and operating officials with information about possible patterns of social effects and societal vulnerabilities which would result from nuclear attack on the United States, the authors of this volume survey the knowledge of the social sciences, as this knowledge may be applied to an analytic task made more difficult by (1) the limited experience with actual effects of nuclear weapons on human society, and (2) present limitations in social science knowledge, which do not permit full description or prediction of many complex events resulting from interactions among levels of the total set of behavioral and institutional determinants formed by society. The authors center their analyses on the various ways in which social structure and social institutions may be considered to be vulnerable to nuclear attack.

The first Part of the book is a monograph on the general problems of societal analysis posed by attempts to study the vulnerabilities of social structure to nuclear attack. The central theme is that levels of behavioral ordering beyond the individual -- particularly social institutional and social organizational processes -- set the dimensions for the social effects of attack. Part II of the book consists of five essays on particular domains of social effects which may result from nuclear attack and on particular methodological problems which must be solved in the study of social effects. The authors here consider individual-human and social

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