The Radiating Brain

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THE RADIATING BRAIN

By

Ferdinando Cazzamalli

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BY: Ferdinando Cazzamalli

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Prof. Ferdinando Cazzamalli
University of Modena

THE RADIATING BRAIN

Phenomena of Electromagnetic Radiation of the Human Brain During Intense Psychosensorial Activity in Dream, Hallucinatory and Telepsychic States.

"An experimental science would be... a science created by experiments, a science one reasons out from experimental data obtained under conditions created and determined by the experimenter." (Introduction to the study of experimental medicine).

— Claude Bernard

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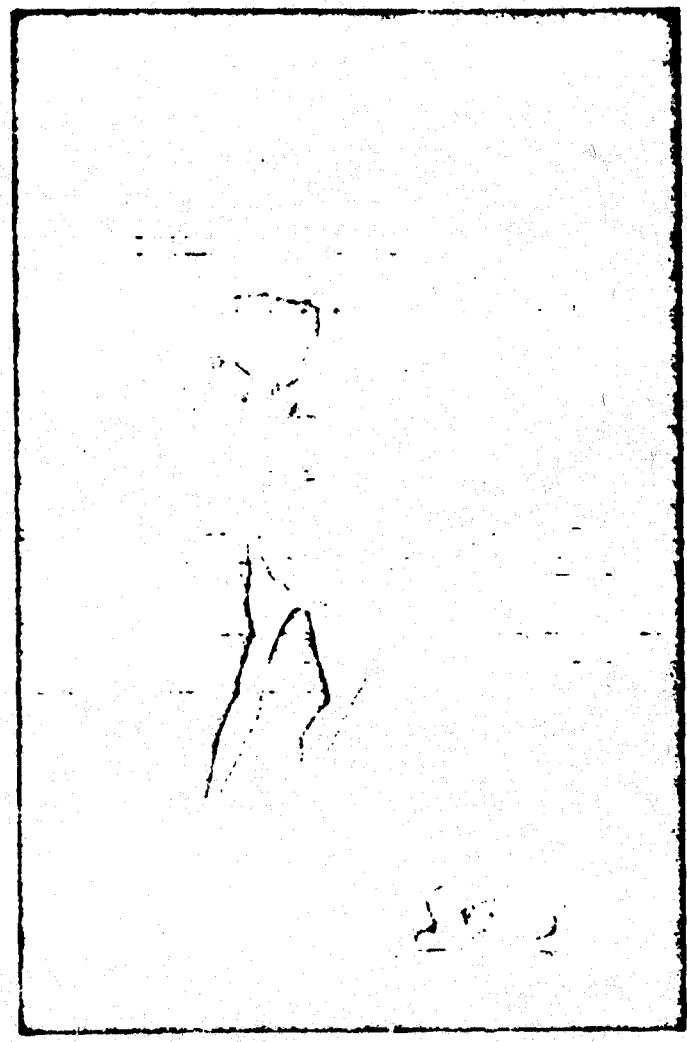

FERDINANDO CAZZAMALLI

Born in Crema (Cremona) the 4th of August, 1887, died in Como the 30th of December, 1958. Neuropsychiatrist. Laureate in medicine and surgery; professor at the Graduate School of Clinical Neuropsychiatry of the University of Modena; member of numerous scientific academies and societies; author of experimental research in psychobiophysics which led him to the discovery of the radiant electromagnetic phenomena of the human brain in a state of intense psychosensory activity; author of more than 100 scientific publications; Director of the review "Metapsychica" and of the journal "Il Salvatore"; President of the Italian Scientific Association of Metapsychis; Deputy to Parliament for sessions XXV and XXVI; a convinced socialist, he fought against fascism until the end; the war of 1915-18, the war of 1940-43, the war of liberation. Patriot.

FOREWORD

It was only in 1929 that the publication appeared in which Hans Berger made known that it was possible to collect and record the variations of electric potentials of the human brain, and it was he himself who called the drawings of these recordings electroencephalograms.

The existence of cerebral electricity had been demonstrated in animals by the English physiologist Caton, without arousing much interest at the time; and Berger's same research, begun in 1902, was conducted at first on animals.

With this premise, we can certainly number Ferdinando Cazzamalli among the pioneers of electroencephalography conducted upon man.

We shall see described in this volume the instrument devised and constructed for the research in question, as well as the techniques of the investigation and the discoveries, all this with copious illustrations. The author notes the precise, competent and conscientious electrotechnical collaboration afforded him by the engineer, Gnesutta.

He launches himself, however, into a wide range of interpretations which causes one to think. To think about the studies of Cazzamalli, and above all to take into consideration whether more credit is due to him than he has received. We see in all fields that the applause of the masses is based more upon heterogeneous contingency than upon intrinsic worth. Cazzamalli's research did not have a brilliant enough label for the many larks fluttering in the too hospitable fir-

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mament of academic speculation.

It is interesting to read the comments which he engenders about the phenomena of electromagnetic radiation of the brain, the electromagnetic receptivity of the brain and even the metapsychic phenomena. One completely materialistic colleague wrote to me some ten years ago, about Cazzamalli's research, that the confirmation of these results would amount to an identification of psychic phenomena with biological activity. Far from identifying, it was just the contrary. Fernando Cazzamalli, antispiritualist in metapsychics, was in reality a spiritualist in philosophy. The substratum of a certain vital manifestation is one thing and the essence of this manifestation is another, especially where the life of the mind is concerned. We have a rather eloquent example in the relation to the play of that switch which is the non-cephalic center of the consciousness, and what a miracle that it is subjectivity from whose center springs the action of the brain upon nervous activity.

I hope that this volume which I have the honor to present to the students of this subject will result in the addition of Ferdinando Cazzamalli's name to the history of this important field.

Gaetano Boschi

AUTHOR'S PREFACE

In a golden little book called "Gli strumenti della conoscenza" [the instruments of knowledge] my renowned fellow citizen from Crema, Giovanni Vailati, mathematician, philosopher, philologist, psychologist, pedagogue, writing about experimental research by the scientific method, proposed this thesis: "A hypothesis has value only if it is able to suggest specific experiments for proving or disproving it."

This is what I kept in mind while I was outlining my experimental program in psycho-biophysics on the intense psychosensory activity of the human brain in a hallucinatory, telepsychic state, using absolutely new procedures and criteria.

I submitted the results of my first experiment in 1925 to the great neuropsychiatrist Leonardi Bianchi, who accepted them for publication in "Neurologia" No. 4 (July-August, 1925), the Italian Review of Neuropathology and Psychiatry, of which he was the editor.

This report was published again in the "Revue Metapsychique" edited at that time by the neuropsychiatrist, Dr. Eugenio Osty, head of the International Institute of Metapsychics, by "The Journal of the American Society for Psychical Research" and by the German review, "Zeitschrift fur Parapsychologie."

When I presented my report, "Les Ondes electromagnetiques en correlation avec certains phenomenes psycho-sensoriels du cerveau humain" [Electro-magnetic waves in relation to certain psycho-sensory phenomena of the human brain] at the Sorbonne meeting of the 3rd Interna-

tional Congress of psychical science in Paris in 1927, the great physiologist, Charles Richet, who presided that memorable meeting, spoke with flattering approval, recalling that he had solemnly stated to the Edinburg Congress of Physiology in 1924: "Physiologists and physicians, can you assume that you have completed the physiology of the brain? That there is nothing more to discover? And that you have outlined all its capabilities? The brain is a much more complicated machine than we naively suppose. Why should this marvellous machine not be occasionally able to perceive vibrations which pass unnoticed by the consciousness? That, my dear colleagues, is physiology. Study, then, this special sensitivity of the brain. Put all of your effort into this study. As the saying goes, which is dear to me ... be as daring in hypothesis as you are rigorous in experiment."

And afterwards, he wrote me in the following terms: "Continue your research. You are on the right path. Your attempt to make known some of these vibrations is one of the most daring and fertile attempts of modern science." Later he said: "How right you are to continue your fine work on nervous vibration!!!."

Indeed, the study of the cerebral mechanics of the dead brain in its macro and microscopic, normal and pathological expression, proceeded along with the study of the function of the living brain which required techniques beyond those of anatomy and physiology, new techniques with which I could henceforth grasp cerebral psychobiophysics as this field developed.

Later, Professor A. Boutariac of the Faculty of Sciences of Dijon wrote to me: "Many thanks, dear colleague, for such an interesting article which you were kind enough to send me. It puts a magnificent finishing touch upon your preceding work, and the whole constitutes a contribution of the first order which I am happy to be able to make

known in my country."

And further: "... and since I am quite interested in the products of Italian science, I would be happy to try to reproduce your remarkable results in my laboratory at the faculty of sciences and the medical school where I teach biological physics."

Our great neurologist and psychiatrist, Enrico Morselli, inviting me to describe my research in the "Quaderni di Psichiatria" which he edited, wrote to me: "Certainly, it is much to state, and more yet to justify this fascinating argument, upon which you have shed unexpected and new light."

And he added: "Meanwhile, I would like students of neuropsychiatry to be more interested in your research. Could you write an article about it for the Quaderni de Psichiatria, describing the results which you have obtained, in which perhaps could also be found the explanation of cerebral and mental disturbance? I have been convinced for years, for example, that there can be something real, something objective, which might be explained (not in all cases, but among others, that of psychic visions) by the emanations of "psychic" waves? ... And why not? ... I would be very grateful for this favor."

Meantime, the review of radiotechnique called "Radio" edited under the auspices of Gugliemo Marconi, asked me for an illustrated article based on the report given at the Sorbonne, which appeared in No. 115, January, 1928, under the title "Le onde elettromagnetiche in correlazione con alcuni fenomeni psicosensoriali del cervello umano, e con illustrazione delle corrispondenti figure di apparati radioelettrici e dei primi radiocerebropsicogrammi." [Electromagnetic waves in relation to some psychosensory phenomena of the human brain with illustrations of the corresponding figures of the radioelectric apparatus and the first radiocerebropsychograms.]

Comforted by so much interest and by such illustrious encouragement, my research developed little by little with unbroken rhythm, and I gave an account of it in some congressional sessions (2nd National Convention of Radiobiology in Rome in February, 1934, at the Vth International Congress of Psychical Research at Oslo in August-September, 1935, at the XXIIIrd Meeting of the Italian Society for the Progress of Science at Naples in October, 1934) and in publications which appeared in the "Giornale de Psichiatria e di Neurologia" edited at that time by our neurologist of international fame, Gaetano Boschi, in the "Archives Internationales de Neurologie" of the great Auguste Marie, while in 1941, the review, "L'Energia elettrica" asked me to publish a report on the most recent apparatus in my employ. "O.X. complex for electromagnetic decimetric waves or microwaves," and prefaced the publication with this note which I am pleased to requote here: "We hope to please our readers by publishing this article written for them by an illustrious Italian scientist, in which we shall find notes on some phenomena unknown until a few years ago, and which opens a new field as much in electrology as in biology. The newness which surrounds the subject, and even more, the natural interest that such phenomena awaken in us, pertaining as they do to the mechanism of life, consciousness and human thought, seem to be sufficient reasons for admitting to these columns an article on a subject related to the study of electric phenomena and to the industrial field."

Later, the expert electro-technical engineer, G. Cuboni, wrote a critical review article of my work for the review "L'Energia elettrica" (January, 1941) in which he stated: "Professor Ferdinando Cazzamalli of the University of Rome can be considered, because of these studies, as one of the most important pioneers of research on psychoneurial activity, and of the singular phenomena which accompany it.

His is the first experimental inquiry into electromagnetic phenomena radiating from the human brain, whose effective existence appears for the first time in his work in electrobiology with the results of his original experimental research. For that reason, we should be grateful to Professor Cazzamalli for having brought to light the hitherto unpublished results of his noble efforts, and we wish for him and for all humanity, that he will soon reap the fruits of these labors."

From 1942 to 1955 followed another series of experiments in radiant electromagnetic phenomena of the human brain during intense psychosensorial activity of the hallucinatory, telepsychic and oneiric states, with the apparatus OXI, informative radioelectric apparatus for super-reactive and super-heterodynous microwaves.

I must mention the valuable collaboration in all of my psychobiophysical radioelectric exploration of the human brain in intense psychosensorial activity, of the doctor of engineering, noted expert in radio-technique, Eugenio Gnesutta, to whom are owed the drawings for the construction of the radioelectric apparatus, and I must also mention the help of the diligent and skillful technician at the Department of Physics of the Milan Polytechnique, Mr. Ferdinando Rosa, who worked under the direction and with the approval of the engineer, Gnesutta. To the memory of that most tireless collaborator, Mr. Rosa, recently and prematurely deceased, go my kindest thoughts of affectionate esteem and gratitude.

Asked by the esteemed students and scholars of the Aism, who became interested in these psychobiophysical explorations of mine on the psychosensorial activity of the brain, to gather into one volume the results of my search on the phenomena of electromagnetic radiation of the human brain in intense psychosensorial activity, from their beginning up to the present, I herewith comply willingly.

I wrote for the above-mentioned review of radio engineering, "Radio" in 1928: "Truly, I do believe that if one could obtain a finer, more exact, and more precise photographic and cinematographic representation of the electromagnetic waves radiating in correspondence to definite psychic and metapsychic phenomena, one could experimentally challenge still unexplored regions of cerebral dynamics, in regard to entire categories of facts, the physiological and pathological psychosensorial mechanism, the phenomena of memory, dreams, hypnotism, transmission of thought, the phenomena called cryptepsychic or telepsychic."

Today I can affirm that some objectives have been achieved, but that the way lies open for the gathering of other benefits from the incessant technical progress of this dynamic epoch and particularly in the prodigious development of radiation physics.

F. C.

INTRODUCTION

HYPOTHESES AND EXPLORATORY EFFORTS IN THE FIELD OF HUMAN RADIATION

The principal hypotheses, both old and new, concerning the human body's emanation of a force or an energy X in certain circumstances, from which followed attempts at experimental exploration, deserve a fair mention.

Actually, the exploratory efforts in this field have been innumerable in the current century. While I regard it as superfluous to mention all of them, since many are the fruit of illusion, I believe it useful to describe briefly those which, even though they did not attain their objective, either contributed indirectly toward orienting further and more fruitful research, or lent themselves to later experimental developments whose fortunate successes we record today.

The first organic hypothesis of a fluorescent energy of the human body under certain conditions goes back to the XVII Century.

Maxwell, physician to Charles II of England, argued in De Medicina Magnetica that "corporal rays, directed by the mind" could activate certain physical processes at a distance. But this hypothesis had been anticipated, centuries before, by the dogmas of some of those well-known people who were accustomed to think along these lines.

The Telesma of Hermes, the living fire of Zoroaster, the generating fire of Heraclitus, the astral light of the Cabbala, the Alcabert of Paracelsus, the spirit of life of the occultists, the life-force of St. Thomas – do they not perhaps signify, under an esoteric veil, the radiation of human energy recognized by its effects, if unknown in its

essence?

The Physician Mesmer and his disciples, a century after Maxwell, called all magneto hypnotic phenomena "animal magnetism."

In the XIX Century, R. Buchanan hypothesized that the energy emanating from the human body originated in the central nervous system; calling it "neuroara," he held that there existed a physical force between electricity and heat, metaphysically explained as the connecting link between soul and body.

This intermediary quality assumes the name "Od" in the works of Reichenback, who supposed the universe to be permeated by this magnetic effluvium, detectable only by sensitive persons, and for that reason not identifiable with any physical aspect of energy known at the time.

Gasparin's "life fluid," Barety's "neural force" (1886), Baradue's "fluid life force," Joire's "psychic force," Lombroso's "cerebral irradiating force," Patrizi's "cortical vibrations," and Morselli's "human biopsychic radioactivity" form a whole chain whose successive links become more and more rigorous in hypothesis, as is evidently necessary for experimental inquiry into the existence of a fluorescent energy of the human body under certain conditions, hypotheses suggested by the accurate observation of phenomena as yet unexplicable.

The source appears to lie in the nervous system. The nervous wave, according to Leonardo Bianchi's precise definition, supports the synthesis of the material (whose ions are transformed into nervous waves) and of its force, just as the nervous system transforms cosmic energy into psychic equivalents. From the complex mass of recent experimental research, including my own, I find reason to support this psychic equivalent of cosmic energy as one aspect of the <u>fundamental energy</u> of the universe.

Thus do we proceed laboriously in very small steps from the abyss

of ignorance, acquiring fragmentary knowledge; here we are offered all that we like to classify as physical and metaphysical, psychic and metapsychic.

But in the dynamic XX Century, hypotheses no longer sufficed. We wanted proof of this supposed force or radiant energy of the human organism, and besides the proof, the identification.

ATTEMPTS AT EXPERIMENTAL EXPLORATION

Attempts to demonstrate experimentally, with special equipment, the existence of this force radiating from the human organism, thought of as the causal agent in the obsolete magnetic-hypnotic and sensory-mediumistic phenomenology, thought of also as the element which, by its equilibrium or disequilibrium, indicated health or sickness, began with Dr. Collonques. He restated an assertion of Grimoldi (XVIII Century) and of Leannec (XIX Century) to the effect that the human body is the seat of very faint acoustical vibrations, perceptible only in the fingertips, and when there was a noticeable difference, he judged it to be a sign of illness.

His bioscope, which I would like to mention because of its potential for the nervous system, consisted of an aluminum needle hung horizontally from a twisted cotton thread fixed to the center of the ceiling by a short of quadrangular yoke, above a horizontal clock face.

The yoke of sheet iron and glass has lateral sleeves into which the hands can be introduced. Through the influence of cutaneous perspiration of the hands, the twisted thread tends to react hygroscopically, swelling; the needle is displaced an. turns relative to the dial.

Lafontaine, an expert in human magretism, modified the bioscope in order to demonstrate the "special mesmeric fluid" simplifying it and calling it the "biometer."

His apparatus consists of a metallic needle (copper, silver, gold

or platinum) suspended horizontally by single silk thread at the center of a closed bell jar and free to move relative to a dial. The needle deviates when one places the fingertips on the outside of the bell jar. According to Lafontaine, the needle moves in a direction imposed by the will of the subject.

Boirac substituted a straw stylus for the metallic needle.

— The abbot Fortin, a meteorologist and inventor of a barometer, constructed a magnetometer consisting of a grounded base-condenser, (made of sheets of tinfoil folded on one another, but separated by an insulating substance); above the base, a metallic multiplier made of a long thread from which revolutions are quite isolated, and, above this, a dial over which an unmagnetized magnetic needle moves freely. The whole assembly is housed under a bell jar. A hand placed on the outside determines the displacements of the needle. With this apparatus, which, slightly modified, is called the biometer, Baradue proposed to measure "nervous tension" and gave an account of his experiments in 1893 in a book "Sulla forza vitale, sul corpo vitale fluidico, e la suia formola biometrica" [Life force, the vital body fluid and its biometric formula].

In 1901, E. Geoffriault communicated the results of three experiments with an apparatus of his own invention, called simply a biometer or magnetometer.

The particulars of his techniques are as follows: a lightweight vane system is suspended by a single strand of silk under a bell jar; the assembly is placed on a marble plate to exclude possible ground vibrations; reflected rays from a lamp illuminate the apparatus, while an observer in an adjoining room reads the movements of the needle in a mirror placed above the graduated dial.

The substances or objects that were to cause displacements of the

needle were brought near to it on a movable table. According to Geoffriault, dead animals did not influence his apparatus. Living animals, including the human body, exercised an attractive force, while a repulsive force was manifested by inert objects in contact with living beings.

Thore's small cylinders functioned not under a bell jar, but in the open air; these cylinders were suspended by a silk thread, revolved under the influence of a hand presented to them, and changed the sense of rotation when the other hand was presented.

Count Tromelin's so-called fluid-paper motors consisted of cylinders, gears and coupled cones (crossed diametrically by a reed stem with a needle in the middle whose point rested on the bottom of a small porcelain vase serving as a pivot); it was said that these paper motors revolved under the influence of the hands or other parts of the human body in preferential directions according to the hand or part exposed.

Joire's stenometer and the Rayol apparatus followed in chronological order, both protected by hermetically sealed bell jars. Both of them reacted to the approach of the human hand by movements of the equipment.

Since I tried at length to check Joire's apparatus in 1912, I will give a personal judgment further on.

The Fayol apparatus consists of a cylindrical body formed of tiny strips of drawn or tempered steel soldered to tin. At the top and bottom, the cylinder is crossed by a steel wire resting on a pivot, which revoles in a sapphire bearing. The upper extremity of the piece revolves in another sapphire bearing. Friction is reduced to a minimum by a central regulating screw. Other screws regulate the horizontality of the base on a spirit level, while the bell jar protects the apparatus from oxidation and dust.

Fayol tried at length to determine the influence exercised by shields of various materials placed between the hand and the cylinder, wishing to exclude the influence of heat. But the fact that cold impedes the movement is in itself an incontestable objection. With such an apparatus Fayol should have noticed:

a) a difference in the movement and in the direction of the movement between the right and left hands;

b) that when a hand of a person does not in itself activate the apparatus, if another person joins the first, placing one hand on his shoulder, the movement is quickly manifest;

c) that if reconstructed entirely in wood, the apparatus reacts in the same manner, which answers the objection that the metal apparatus reacts to the electricity of the human body;

d) that the influence disappears if the person is fatigued, though it is evident in the state of normal health, while the sense of the rotation of the equipment reverses in relation to the state of illness.

Dr. Joire's stenometer consists of a pointer (reed stem) suspended by means of a strong steel-pointed fulcrum and moving over a graduated dial; a bell jar covers the assembly. The cloth-covered rectangular base projects enough on both sides to give space to press the hands.

The experimental procedure is very simple: the right hand is pressed against one side of the instrument at the end of the pointer so that it forms a right angle with the fingertips; it remains immobile in this position for 5 minutes; the pointer moves and then stops, and the experimenter measures its angle of displacement.

The same procedure is repeated using the left hand. Thus two numerical values are obtained for the two circular arcs described by the pointer.

These figures, writes Joire, are interesting from two points of

view – how far each angle deviates from the norm, and the proportion between the two numerical values obtained from the right and left hands.

Normally, the right hand gives an angle of displacement larger than the left hand; these figures obtained by Joire from normal subjects are sufficient to convince us:

Right hand:	23	24	26	22	29	20	33	21	24	20	33	32
Left hand:	18	20	20	19	22	21	24	19	19	17	29	25

From these figures we can see that there is an average difference between the values of the right hand and of those of the left hand, for in most cases, the left hand produces a smaller displacement than the right, varying between a fifth and a seventh of the value obtained for the right hand.

It is therefore not the absolute value of the separate figures, nor their maximum and minimum limits, but their relation to each other, which is interesting and which gives value to the result; more important than that is the fact that according to Joire, this proportion between the right and left hand varies with amazing regularity in various diseases of the nervous system, thus facilitating or even directly indicating the diagnosis.

That the variation of the average is a pathological index can be demonstrated by the fact that if the patient undergoes suitable treatment, progressive improvement is seen on the instrument by the progress of the average toward the normal difference as the patient progresses toward health; on the other hand, the stenometer would warn precisely of a relapse or of the intervention of a new morbid factor.

Moreover, in the case of considerable depressions of the nervous system following acute nervous breakdowns, the values on the stenometer would fall even to zero.

THEORETICAL CRITIQUE AND EXPERIMENTAL VERIFICATION

We see how these experimental attempts to prove by mechanical reaction the existence of a "nervous force" emanating from the human organism were assembled.

We shall see a priori theoretical denials and experimental verifications. The former are useless to record. They are the typical manifestations of mental laziness, a not infrequent component of human intelligence, when they are not expressions of less elevated motives such as the preordained exclusiveness of own's own scientific opinions which neither facts, nor observations nor experiments could disturb!

The latter, the experimental verifications, are such that they should really be taken into consideration.

P. Archat undertook a series of verifying experiments to see if human subjects could exercise a motor action from a distance; he constructed for this purpose an apparatus of the type already described, with the mobile needle and he concluded that any movement of the needle must be attributed to the heat radiating from the hand of the subject. At the end of his experimental work, (1908) he made this reservation: "if the result of my research is negative. I think that I must not conclude that the force whose presence I sought to verify absolutely does not exist, but that we must seek to study it with means other than those which I used."

Also Warcollier (1908), who (in collaboration with Archat) subjected Tromelin's "fluid motors" to long and diligent experiment, contested the intervention of causes other than the radiation of heat in the function of these instruments.

In fact, Warcollier specified:

1) that if the left hand is put behind the apparatus and turned in such a way that it occupies the same position as that taken by the right

hand, the rotation is shown to depend not upon differing polarities of the two hands, but upon their positions.

2) that when the apparatus is placed in an oven, it is sufficient to elevate or lower the temperature less than one degree for the apparatus to start revolving in one direction or the other; this demonstrates that the heat of the hand could be sufficient to create an air current capable of causing the rotation.

More recently, Clemente Martin experimented with these instruments; in open air with praiseworthy perserverance and ingenuity. (Tromelin's little motors and Thore's pendulum) and in a closed vessel (Lafontaine's needle, Boirac's straw, Collonques' bioscope, Joire's stenometer).

Clemente Martin constructed his research apparatus with all the best ideas, complete with thermometers and with metallic foil, giving it an "artificial hand" by which the temperature imbalances could be controlled.

The author concludes definitely: "The angular deviations or complete revolutions of the needles using this equipment and these techniques are caused exclusively by air convection due to the thermal radiation which living bodies emit, and the sense of the movement of the needles and instruments is only a function of the distribution of heat in the organs under experimentation."

Joire's stenometer, however, would seem a first glance to fall outside this rule. But if we compare the slow and weak amplitude of the movements of its needle despite its extreme mobility, to the greater velocity and amplitude of the movements of the needle in Boirac's apparatus which differs from Joire's stenometer only in the method of suspension, the difference between these two techniques is reduced to the height of the air column necessary for the convection which, though greatly reduced in Joire's stenometer (which explains the slowness of

its movements), does not constitute, according to the author, the only cause of the displacements of its needle.

Clement Martin declared in summary, contradicting his first suppositions, that he had discovered no movements of the elements of the aforementioned instruments "that can be attributed to causes other than thermal effects."

Hans Hamilton asked Clement Martin a number of questions in defense of the ability of Tromelin's, Thore's and Joire's apparatus to reveal human magnetic radiation; to these Clemente Martin was able to reply point by point.

Montandon regretted that Clemente Martin did not experiment with Fayol's apparatus, but this in reality is only an improved version of the apparatus in the closed vessel (Joire, etc.). He admits that the minute precautions taken by Archat and Warcollier first and then by Clement Martin oblige him to take their conclusions into rather serious consideration, since they discount the intervention of any cause other than the simple caloric action coming from the hand. But he tends to overvalue any data produced by the apparatus in a closed vessel.

Now since Joire's stenometer seems to end up being the least objectionable and the most worthy of consideration, supported as it is by Clemente Martin's more recent inquiries, I shall refer to the systematic experimental research which I personally conducted in the Laboratory of Experimental Psychology of the Psychiatric Institute of Emilia Street (directed at that time by Guicciardi, one of the founders of experiomental psychology) to verify its fundamental diagnostic value.*

I began brief control experiments designed to examine the problem of heat more than anything else. I used a slender glass flask with bulb end and a 15-cm cylinder of 70 ml capacity containing water at various temperatures. I put the extremity of the next opposite the stenometric

needle while the swollen part constituted the distal extremity; the reaction time was 10 minutes. At temperatures from 0° to 10°C, I never obtained any reaction even after numerous trials.

On the other hand, elevated temperatures of 45°-50°C and higher always gave attractive reactions, generally small and ranging from 4 to 12 degrees; the displacements of the pointer were not exactly the same for two tests run at the same temperature. When the mouth was allowed to cool in place, the displacements, still in the attractive direction, were from 14 to a maximum of 44 degrees, without there ever being a fixed relation between the temperature and the displacements of the pointer.

For temperatures of 28°-32°-37°C (approximately those of the hand and the human body) there was at times no reaction after 10 minutes; at times, small reactions in the attractive sense, especially when the temperature oscillated between 32° and 37°C, of 2-40-10 degrees. But at these temperatures, when I left the bottle in place to cool the water, I obtained noticeable displacements in an attractive sense, running up to 33 degrees.

From these controlling experiments, I became convinced that the heat radiating from the hand must actually be at least a partial cause of the displacement of the stenometric pointer.

On the other hand, the instrument itself is not free of drawbacks; the slightest movement of the hand, the vibrations propagated by walking on the floor, a cough that shakes the subject can influence the stenometric pointer; no matter how the experimenter seeks to maintain optimum conditions, controls are still necessary, especially for certain abnormal reactions, which are not infrequently to be observed.

I also wanted to see if <u>animals</u> gave a stenometric reaction; I used guinea pigs whose bound extremities I drew toward the end of the steno-

metric pointer, first the anterior, then the posterior pole of the body.

For the living guinea pigs, after many experiments, I can conclude that the reaction is always in the attractive sense, toward the body of the animal, no matter which end of the body was turned toward the pointer, and that the displacement varied from 1 to 8 degrees.

Dead guinea pigs never gave any reaction. This fact seeming to me not without interest, I tested dead human individuals, (dead from a few minutes to some hours). From the cold cadaver, no reaction. From warm cadavers, especially if the temperature at the moment of death or slightly before had been elevated (M.G.t. 39.5°; B.C.t. 38.6°) a weak stenometric reaction; while for those who died without fever, no movement of the stenometric pointer was observable.

But Joire observed, as I pointed out, that the normal individual always produces a given reaction within given limits; that the difference between the right and left hands is in itself an index of the neuropsychic normality of the subject, while the neuropathic or psychopathic individual gives different stenometric reactions whose inalterability for certain diseases provides one with decisive diagnostic data.

In 1905, Guicciardi began experiments upon himself and upon other subjects with a laboratory stenometer, taking accurate note of the actual physiopsychic conditions and the reaction time; his experiments were left unfinished.

Following the example of Guicciardi, I recorded ten of my own stenometric reactions on different days from April to May between 16 and 17 hours in the same place and in perfect quiet. And I also tested the reactions of ten normal individuals, between twenty and thirty years old, chosen from among the personnel of the infirmary; for every one of the subjects, I repeated the experiment after one month, holding all of the other experimental conditions constant.

The Guicciardi reactions showed that according to Joire's averages only two out of nine obtained for a given normal person can be classified as pertaining to a normal individual. The same percentage follows from my experiments.

Finally, submitting the figures given for ten normal individuals to the same comparisons, we see that 1/10 of the subjects give the normal reactions in the first run of experiments, but in the second run, none of the (perfectly normal) subjects produced normal data. Moreover, if we compare certain reactions of Guicciardi's, or my own and of the ten normal subjects to Joire's models, we will soon see in the reactions of normal subjects (such as Guiccardi's and mine) indications of various diseases, and in other normal subjects, we see reactions characteristic of specific neuroses.

These brief comparisons should suffice to demonstrate that the possibility of the most disparate reactions in the normal subject, and in healthy individuals in general, removes any basis for Joire's classification; which I can only explain as pure artifact.

I later examined hysterical subjects with the stenometer, as well as hystero-epileptics, epileptics and psychopaths. The results were the same. Here are the conclusions taken integrally from my publication of 1913: "Not between given degrees. No specific measurement exists for hysteria or epilepsy. One finds pathological reactions in normal subjects and normal reactions in neuropsychopaths; I disagree completely with Joire's inferences more because of this, than because of the immense margin of error due to the nature of the instrument."

However, to be thorough, I should add two positive conclusions, which are:

1st – Joire's apparatus is sensitive to the immediate proximity of living bodies and certainly not all of the reaction is due to thermal

radiation from these bodies.

2nd – It seems certain that within 24 hours of a violent neuropsychic attack (for example an epileptic seizure) the stenometric reactions are consistently lowered.

But the fact that the principal cause of the positive reactions of the apparatus to the approach of the human hand is no doubt the heat radiating from that same hand (and from the body of the individual) demolishes any effective value for positive experimental results, even a part of these results cannot be unambiguously assigned to heat.

In 1906, Dr. Aleardo Cerioli, director of the Lonato City hospital, performed rigorous experiments with an apparatus he designed and perfected little by little, with a flag and a very light swivel on the point of a needle, in order to demonstrate telekinetic energy in the normal man. In his valuable communication at the XIIIth scientific meeting of the AISM in Florence (June, 1957) "Esperimenti dimostrativi della riflessione e rifrazione della energia telekinetica" [experiments demonstrating the reflections and refractions of telekinetic energy] we can read a reference to an earlier apparatus thus described:

"A thick glass plate is placed upright on a table on one of whose vertical sides is put the concavity of an aluminum bowl held by a support made expressly for this purpose, so that one half of the concavity faces the right and the other the left of the plate; we put my apparatus with the flag on one side of the plate not far from the bowl; we always see the flag move and enter the concavity of the bowl when we put our hands to the half of the concavity farther from the flag: I believe that a force emanating from the hands is reflected from the bottom of the bowl and acts on the flag attracting it, in the same manner that it is attracted when a hand comes near to it. We have thus a demonstration that the attraction exerted by the hand can be reflected in the

same way as light and sound. The effect is analogous to having placed the flag in front of the mirror of a chest of drawers on which stands a vertical iron plate perpendicular to the mirror which separates it from the flag, but from which we still see the image reflected by the mirror: if the hands are extended, we always see the flag move and draw near to the mirror."

Cerioli states in his report: "These data and others gathered from other experiments, led me to the construction of the apparatus in question, of which drawings and photographs are presented herewith. In a common 50 liter glass flask from which the neck has been cut off and which stands in an iron basin, are four metal funnels and two polystyrene bowls turned upside down, the largest of which is held away from the flat internal surface of the bottom, and contains the other which holds up a metal shaft which does not pass through the bottom but goes lower than the metal funnels. Finally, the same central shaft supports a yoke with three branches on the point of a needle. A glass cone is placed on the mouth of the flask whose smaller opening lies a little lower than the yoke. A large glass bell jar isolates the yoke from the outside.

Now it is sufficient to press the hands on the walls of the basin and to touch it lightly with movements like those which among healers and wizards would be called "passes"--but this is not indispensable in our case, let it be noted, because a prolonged, immobile fingertip contact suffices in order to see the yoke become animated after some minutes; it rotates toward one side or the other, sometimes with a delay or a brief pause, after which it not infrequently can reverse direction. The velocity can be from 2 to 3 rotations per minute: and this rotation continues after we have withdrawn from the apparatus, often for many minutes, particularly if someone is present and passes by it

frequently: thus, in a place in which two or three people are always present, the apparatus can rotate almost all day without having any contact other than this. And the very important fact should be noted that when the apparatus is impregnated, if I can express myself thus, with the mysterious fluid or kinetic aura, the lightest finger touch on the walls of the basin suffices for the yoke to respond in most cases with an immediate increase in momentum; this is especially true immediately after the impregnation is obtained. It seems therefore that the energy from the hands collects inside the flask, returns and concentrates at the bottom of the convex polystrene bowls and in the concave metal funnels in a similar but opposite manner to the action of hertzian waves on the element used to transmit television on the top of the transmitting towers."

Another most interesting communication in the aforementioned scientific meeting was that of the engineer Armand Givelet of Paris, called "Nuove ricerche e nuovi metodi fisici de rivelazione delle radiazioni biologiche e specialmente del cosidetto 'fluido umano'" [New Research and New Physical Methods for Demonstrating Biological Radiations Especially the So-Called 'Human Fluid'." Givelet, noted for his research into matter expressed himself thus in his communication: "I shall speak about an apparatus, or rather a complicated collection of purely physical, or also perhaps biological instruments with which it is possible to demonstrate the existence of human fluid in an absolutely objective manner. What are the methods and procedures which form the object of my communication?

1) Instruments which reveal the presence of radiations by means of the ionization of the air, or by variations in electrical conductivity of the insulators. That is to say, the method of Müller of Zurich and my own Geiger-Müller counter;

2) photo-electric instruments or methods such as those of Professor Petri of Rome;

3) and 4) photographic methods, that is demonstrations of biological radiations by means of thin plates or photographic film;

5) use of biological indicators such as microbes, bacteria, either alone or combined with photo-electric cells-called the nephelometric method;

6) various instruments such as Abbot Fortin's most interesting one.

I. APPARATI WHICH MAKE USE OF THE IONIZATION OF THE AIR OR OF VARIATIONS OF THE CONDUCTIVITY OF THE INSULANTS (OR ISOLATORS)

The principal element is that which Müller called the indicator. It is composed of an insulating plate (for example, glass) on which are fixed or glued two metal electrodes; the distance between the electrodes is rather small, hardly a millimeter.

The indicator is introduced into the circuit of a very sensitive galvanometer in series with battery of 100 volts, for example. The galvanometer cannot deflect since the electrodes are separated from one another; but if a person capable of emitting the fluid approaches his hand, the light ray sent back from the mirror of the galvanometer moves little by little and indicates the emission of the fluid.

Scientists, or rather the representatives of official science, say that these experiments are valueless, for three reasons to which it is easy for me to reply directly:

First criticism: It is the natural heat of the human body, the body temperature of 36-37° which causes the galvanometer to move.

This consideration is absolutely false, because if we draw a very hot object near to the indicator (for example an electric soldering iron), the galvanometer does not move.

This consideration is absolutely false, because if we draw a very hot object near to the indicator (for example an electric soldering iron), the galvanometer does not move.

Second criticism: It is the natural perspiration (or sweat) from the hands and the humidity which results, the little bit of water vapor from the hand which causes the galvanometer to move (or to deviate).

But if we enclose the hands in a sack (for example cellophane) the deviations of the apparatus will still be observed. One can even put a metallic shield between the hand and the indicator, and the fluid will cross the shield and cause the galvanometer to move.

Third criticism: It is the electrostatic capacity of the hand.

To reply to this criticism, we can place near to the indicator some metallic object even larger than the hand, and the galvanometer remains immobile.

On the other hand, the emission of human fluid is irregular and proceeds by fits and starts. Instead a capacitance effect would not have an irregular character. It would be perfectly regular.

II. PHOTO-ELECTRIC METHODS

When a photo-electric cell coupled to an electrometer is exposed to biological radiations, the charge or the discharge is observed according to the scheme adopted.

Professor Petri of Rome has constructed a very interesting apparatus with which he has been able to measure the photoionization of the air produced by the germination of grains of millet or corn.

Müller also constructed an apparatus with two small aluminum discs, one of which is fixed and the other attached to a horizontal needle suspended by a very thin thread. Under the effect of the radiations (or rather the photo-electric effect of these radiations) the two discs become charged with electricity and are pushed back.

III. PHOTOGRAPHIC METHOD

We shall see on the screen the results obtained with photographs of the radiations of yeast in a tighly closed glass tube.

I must say a few words about the nephelometric method. As everyone knows, by the application of this method, the opacity of a liquid medium or semiliquid can be determined with a photo-electric cell by passing a ray of light through the medium. But if, as in the present case, we want to study the action of specific radiations, for example on the development of certain living beings, and more particularly on microbes, we take two recipients into which we pass a ray of light.

Here we see the lamps, which emit a certain luminous flux, through the recipients, into which we have put the same weight of microbes. S indicates the source of biological radiation, for example the hand of a person capable of emitting a considerable quantity of fluid. Well, what follows? If this person extends his hands or even one hand from time to time (for example every day, 20 minutes per day) after a week, most of the microbes are destroyed, or at least do not grow; the recipient – which should be transparent – remains clear and allows light to cross it, while in the other recipient to which the action of the hand was not presented, the microbes were noticeably increased. The recipient became turbid, letting through hardly any light from the lamp.

We understand then why the measuring apparatus, together with the photo-electric cell (on the right) indicates the intensity of the photo-electric current, while the measuring apparatus connected to the photo-electric cell (on the left) does not indicate any current to speak of (or a rather weak current).

To conclude, we shall see various methods which allow us to study this property of biological radiation, such as the dimunition of intensity of these radiations when they cross metallic shields, whence we

can determine if the law of observations of such radiations on the shields is the same as for x rays used in medicine. As we know, this law is a logarithmic law, that is, the current in an ionization chamber diminishes not accerding to the thickness of the shield, but according to the logarithm of that thickness.

When we have determined this law, we shall have made a large step forward."

* * *

Heat radiating from the hand was also studied in photographs of "human effluvium" emanating from the fingertips. In 1894, Dr. Lugs had the idea after having placed a plate in a developing bath, of applying his fingers for 10 or 20 minutes. After fixation, the imprint of the fingers was found outlined by an aureole and by luminous needles which seemed to be emanations. David, Brandt, Mejewsky, Darget and Paraduc persisted in this technique and in the belief in positive photography of the "vital fluid."

Guechard and Yvon had aready demonstrated experimentally that the effluvium was purely caloric, and recently (1926) Dr. Menager, taking up the hypothesis of these experiments, concluded definitively that "the effluvium whose image is fixed on the photographic plate is only pseudo effluvium, conditioned by heat." But he notes with logic and scientific prudence: "Shall we say that the human effluvium does not exist? Surely not. But we must seek to record it with other procedures."

The procedure of application of the dry hand on the plate, and the discussions which followed at the Universal Society of psychical studies in 1908, of the physical action of heat from the hand and the chemical action of the sweat-secretion, gave the clue to the phenomenon to the experimenters (Fontanay, Saint Albin, Warcollier).

But in this series of experiments we must mention Dr. Ermente Fon-

tane, laureate in pharmacy, who worked for many years with meritorious constancy on human radiations with photographic methods. In 1955 at the XII scientific meeting of the AISM at Salice Terme, he presented a communication, "Radiazioni umane" [Human Radiations] in which he stated.

"In the inter-regional meeting of 7 October 1948, held in Milan, I presented some demonstration items and referred to experiments on the initial mummification of organs like the liver or muscle, using massage.

Afterward, I had the idea of massaging x-ray plates hermetically sealed in various boxes, in an attempt to find out which radiations could be detected.

When I had acquired the bundle of plates, one of them I did not develop immediately in fear that it would be changed. The others which I subjected to massage were developed by various photographers.

After many attempts without result, I finally obtained photograph No. 1 on a plate using x rays.

Seeing mainly marks like lenses, crescents, I thought they were vium coming from the fingertips. But I had quite a surprise when I massaged a plate with my hands after having put my head between two plates.

The usual marks in fact appeared on the plate which I had between my hands, but they were more evident still on the plates which had surrounded my head (photographs No. 2 and 3).

I continued in the same way, in my time free from professional duties, to run through the whole body onto plates, obtaining photographs Nos. 4, 5, 6, 7.

Each time I began an experiment, I forced myself not to think of anything and I put myself into that state of mind which professor Cazzamalli has studied so thoroughly and which he calls "expectation," or

"slight trance."

I took over one hundred successful photographs.

I mention parenthetically that an illustrious physicist, having seen photograph No. 1, told me that he should study me by putting me into a special Wilson chamber.

Another student at Plateau Rosa, where cosmic rays are studied, having seen photograph No. 1, told me that it was a photograph of cosmic rays taken by an inexpert hand.

I am convinced that emanations leave the human body as particles of energy, and that here lies the first cause of radiesthesia, thought reading, healing and mediumistic phenomena.

We should mention various manifestations of the same origin, produced by radiations of sometimes greater, sometimes lesser intensity.

Who can say what force man could develop if he succeeded in concentrating with an iron will all the energy which emanates from his body as does a lens with the sun rays?"

From a biological point of view we cannot gainsay the experiments of Dr. Reitler, head physician of the laboratory for research on malaria at Rosh-Pinach (Palestine), experiments demonstrating the action of living organisms on isolated living organs at a distance.

The author describes the special preparation of a group of insect organs (Saltatoriae Acrididae), ovaries, hind-gut, and malphigian tubules, in a petri dish.

These contractile organs (gut and ovary) or organs with movement (malphigian tubules) demonstrate that they respond to the nearness of man, (aside from caloric influence) to muscular contractions and to the vicinity of cold-blooded animals (reptiles); and the same is true of plants.

We are indebted to Professor Lodovico Armani, the esteemed radiologist, for his interesting research on the action of human radiations on the germination of dry seeds. He writes:

"I was interested in seeing if normal individuals, or those repu-

ted to be such, were able to emit radiations which would act on the germination of seeds.

I adopted the term "radiation" because it seems to me the most appropriate, especially after Cazzamalli has written so much on this subject.

I chose lentil seeds (Ervum lens) for these experiments since they are readily available on the market, and easily handled in any season.

The place for the experiments is partially underground, illuminated artificially, does not communicate directly with the outside, and has very thick walls. To make sure that there could be no radiations coming from outside, I hung up photographic film and plates of varying sensitivity (facing in all directions) for ten months; no radiation was apparent from any direction. The temperature of this basement, heated by an electric stove, is very stable: in the warm months, +17°C in the cold months, +11°C (modifiable with heating).

The preparatory technique for the experiments is the following: a layer of absorbent cotton is placed in a porcelain plate, on which twenty dry lentil seeds are placed in a line. Each plate is marked with a strip of adhesive tape, bearing the indication C for the seeds which were to serve as a control or 1, 2, 3, etc. All the plates were prepared at the same time with the same quantity and kind of cotton, and the same number, 20 seeds disposed in the following manner: all are held in the same environment as the control (as is necessary) but during the filtered illuminations, (as I shall explain a bit farther on) the control is protected.

The seeds are taken from a little sack, conserved in a cardboard box; naturally all those which are broken or which look spoiled are discarded beforehand.

The technique of exposure to human radiations is the following: the dish to be treated (for example No. 1) is put on a table (wooden, covered with a rug made of hemp and wool) with its 8 dry seeds on the absorbent cotton bed above which the hands are held, palms facing the seeds and in the most comforable position possible (seated). They are held thus for half of the desired time; for example 5 minutes of the first 10 minutes. For the other half, the finger tips are held together with the backs of the fingernails against the backs of the fingernails, immediately above the seeds, but without touching them. For convenience, I propose to call this treatment: "imposition of the hands."

The imposition of the hands was made from 11:30 to 12:30 or from 17:30 to 18:30; for the first 3 groups of experiments with a red light about 3 meters from the table, for the others with the usual electric light (2-candlepower bulb) again about 3 meters from the table.

After having imposed the hands for the number of times decided upon, the cotton of all the plates is drenched with water and as long as the seeds are held, (always in the same environment and always in the dark, except for the brief moments necessary for control or re-drenching the cotton) water is added whenever necessary to maintain the plates in the aforementioned conditions. The water is poured from a bottle where it is allowed to remain, and where it takes on the ambient temperature.

The experimental results were evaluated in the following manner: after a varying period of days (it is not always possible to maintain the same germination period as the sproutings are different in different seasons of the year) when one sees an opportunity, one takes a photograph of the plates and repeats it or not according to need. One then takes the little plants off the cotton one at a time and measures the sprout on a 2-decimeter rule, distending the shoot without pulling

it, noting the length in millimeters. If a seed has not sprouted, it is assigned the length 0. One then takes the sum of all these lengths and divides by 20, the number of seeds in each plate; one obtains thus a value which I propose to call: "index of growth." The photographic comparison and the various indices of growth will tell if there is diversity between one group of seeds and another. The measurements are taken before a witness."

And he concludes:

"In any event, from these first experiments, one can argue that effectively, the radiations emitted by the normal human body can influence the sprouting of lentils when applied to dry seeds. In fact, apart from what we have discussed above, one must observe that 1) the control, out of 7 experiments, has a growth index greater in 2 (experiments VIII and X), is equal to that of the imposition of the hands in one (experiment XII) is inferior in the others; 2) the radiations of a thermal light source with colorless glass produces an index of growth inferior to that of the hands in 4 cases (experiments VI, VIII, XI, XII), superior in 2 (experiments IX and X); 3) the red filter depresses the radiations from the lamp and the green filter even more so.

One has the impression that the effects obtained do not depend solely upon the heat emanating from the hands or from the heat and humidity , but must depend in part on another energy. It could be that research on statistically significant samples would allow more certain conclusions to be drawn."

We cannot close this chapter without indicating some observations which, though less noted than the preceding and less valuable, nevertheless kept alive the germ of later harmonizations, coordinations and developments.

Static electricity as a phenomenon of accumulation and discharge in

the body of some animals attracted the attention of biologists and physicists long ago. The electric organs of the electric eel, the electric fish and other fish had been studied.

In 1666 Redi wrote: "It is noteworthy to read among the writings on ocean fish that a fish called a quiverer, or a torpedo, if touched, numbs and paralyzes the hand or the arm of him who touches it."

Only a century later, Wasser demonstrated the electrical nature of the discharge of the electric fish. In 1795, Humboldt worked on the large electric fish of 2 meters length and of 15-20 kilograms weight in Venezuela, the electric eels, endowed with the power to emit discharges of such an intensity as to make a horse faint.

After three quarters of a century, Sachs devoted himself to the study of the electric eel with modern methods, and returning to Europe, carried with him a large collection of observations and measurements and four living electric eels.

As a matter of fact, one can see the presence of "electricity" in all realms of nature and we are indebted to Galvani for the discovery of animal electricity.

Concerning the magnetic phenomena of the human body, it was noticed that in particular psychic states, (trance) the approach of one extremity of certain human subjects (sonambulists, hypnotized people, sensitive people, mediums) to a compass — at 20-30 cm distance, caused the magnetic needle to deviate at times with violent abandon (Breslaner, Fechner, Zolen). I must mention the decisive observation of Dr. Geley, the first director of the inter-national metapsychic institute, on the phenomena presented by the medium Kluski, who extending his right foot above three aptly placed compasses, caused a large displacement of the needles, one of which had to revolve completely around the dial.

The series of experiments which Geley conducted with all due care

and necessary controls, showed in an unequivocal manner, the authenticity of magnetic phenomena.

Gruenewald, experimenting with a ballistic galvanometer with a mirror, discovered that the approach of the hand of certain subjects, under the influence of their will, could augment or diminish the magnetic field. This magnetic intensity of the subjects is diminished when the subject performs telekinetic actions simultaneously, observation that contributes not a little to the identification of the "vital form" with the "energy" in play in paranormal phenomena, though this energy is of a preponderantly different quality from the energy in play in psychic and metapsychic states.

Regarding the phenomenon of static electricity, Crookes observed that the approach – without contact – of the fingers of human subjects, in particular psychic states, causes an electroscope with a gold foil to discharge with a rapidity greater than the norm, indicating a clear electrical reaction.

W. Crookes had noted similarly that a galvanometer could be influenced by the presence of certain human subjects; professor Murani, director of the institute of Physics of the Milan polytechnique, told of this phenomenon, with himself as protagonist. That is, when he presented his breast, the galvanometric needle reacted as if toward a north pole, while when he presented his back, it reacted as if toward a south pole.

Crookes' interesting observation about the discharging of an electroscope with gold foil with greater than normal rapidity in relation to psychic states of <u>trance</u> is confirmed by Branly, Konreivitch, and Imoda, to which last we owe the observation that the discharge was not instantaneous, but that it was produced after a certain time lapse, all at once; he compared this delayed reaction to the fluctuating discharge

of the electric fish.

This influence on the electroscope, being the neutralization of electricity on the gold foil, would let us suppose a particular condition between the fingers and electroscope. This condition could be attributed either to the ionization of the air, caused by the subject himself, or by the emission on the part of the subject of a conducting "fluid." Curie and Langevin did not notice any phenomenon of ionization in the vicinity of the subject. This rather important observation coincides with some findings of my own in experiments designed to answer certain theoretico-practical objections advanced about possible interpretations of experimental results of my research on cerebral psychobiophysics. Research which led me to the discovery of radiant electromagnetic phenomena of the human brain relative to specific states of intense psychosensorial activity. Observation which found a most interesting development by another route in the experiments of the engineer E.K. Müller of Zurich.

The question of how the "neural fluid" conductor can be presented in certain cases under the form for example of a particular current, capable of transporting electrical charges, as well as under other particular forms, remains open. Yet the experiments of E. Osty performed later, confirmed this possibility.

The presence of an electrical tension on the surface of the body is still normally recognized; tension that in certain cases and in certain persons can gain an intensity sufficient to produce an emanation of electricity. Like the Mendelssohns, there are whole families whose skin produces sparks. Through these beings, the familiar neurotic temperament was placed in relief.

Dr. Sartori presented an interesting case in 1933 at the Trent Society for the fight against tuberculosis. It concerned a case of pulmonary tuberculosis, treated with apicolysis and plumage from which a very rare peculiarity resulted which is worth mentioning. He writes thus: "The patient at times emitted (half an hour, one hour) electrical energy on the body surface, energy which manifested itself above all with the formation of sparks crackling and visible in the darkness; a Geissler tube (the ordinary type used to check spark plugs in an automobile or the vacuum in electronic high frequency apparatus) was brightly illuminated even when held 30-40 cm distant from the body of the patient."

Dr. Fere, celebrated French neurologist, noticed in a patient at the Salpetriere whose hair gave off sparks on contact with a comb, another magnetic property consisting of the attraction of a scrap of cardboard toward her fingers like the attraction of a magnet. Moreover, by rubbing a tablecloth on a table, she could establish an electric charge between the cloth and the table.

Charcot had spoken formerly of galeantropy, sparks sent out by dry hair, such as the barely warmed hair of a cat. The abbot Moreux cites the case of students electrified during a physics course and capable even after a quarter of an hour of illuminating a Geissler tube just by holding it.

Another remarkable phenomenon is that certain persons can provoke luminosity for one or more seconds in an electric lamp just by rubbing it with their hands. The rubbing is generally admitted to be the cause of the luminescence. Arsonval says that if a neon tube containing a little bit of mercury is shaken, one obtains a lovely light. The subject's skin and clothing must be dry. Arsonval worked with two subjects,

mother and daughter, whom Dr. Fere of the Salpetriere had brought him.

This is also produced at times by the hand's influence on the lamp at some centimeters' distance. The intensity of this phenomenon has been shown to be related to the subject's psychophysiological condition (Darget, Mondell). During the exhibition of this phenomenon, something like an attraction on the filament contained in the lamp was noted. This phenomenon, still in the stage of study and control, appears to be certainly limited to a small number of subjects.

Charles Richet, as Foveau di Courmelles writes, presented to the Academy of Science, on the 4 February 1924, a note by Henry Cardot and Henry Laugier on the illumination of vacuum tubes by friction. A subject takes a lamp with a broken filament, rubs it and lights it, that lasts for two frictions, then without rubbing, holding it in the right hand, he keeps the lamp lit for two or three seconds. More than this, having rubbed a lamp for some minutes, he retreats one or two meters, "concentrates his thoughts" makes gestures at the lamp, closes it in a glass or metal case, changes position, slowly, slowly, and the lamp has luminous beats, seemingly at will.

This luminescence provoked in lamps by certain exceptional mediums – like Home, Eusapia, Stanislawa – was attested to by observers of genius like Crookes, Morselli, Curie, D'Arsonval: in such a case it seems to concern the emanation of a real and true "fluid" with an electrical and magnetic charge on the part of the subject. Moreover, Ochorowics made public his observation that Stanislawa could close a galvanic circuit between two electrodes 4 mm apart. We will find the development of such interesting experiments in the research of the engineer Müller of Zurich.

Yourievitch and DuBourg thought of putting the subject in an open electric circuit comprising an ammeter and a rheostat attached to the

city power mains at 110 volts; circuit which the subject succeeded in closing by approaching his hand and concentrating his will.

According to DuBourg, the condition established between two copper plates presenting a difference of potential of 4 volts and for which the galvanometer placed in the circuit deviated 6/100 of an ampere, must be attributed to a "tube of fluid force," emitted from the hand of the medium. Grunewald, already mentioned, noticed the electrical conductivity of ectoplasm (tube of fluid force) and found a static-electric reaction proportional to the proximity of the medium's hand to his electrometer.

A propos of the radiating influence, I should record the interesting experiments of the engineer Müller, director of the Salus Institute of Zurich, experiments which professor Farny repeated, and which indicate that the vicinity of the human body can modify the electrical conductivity of some substances: air, silk, gum lacquer, etc.

Müller attributes this action to the emissions by the human body of a certain emanation for which he proposed the name of Anthropoflux R, (the letter R signifies that it concerns a radiation modifying electrical resistance). According to Müller, of all the body surface, anthropoflux R comes out in general most abundantly from the phalanges of the left hand.

Such actions seem to vary according to the physiological state of the subject.

Prof. Farny of the University of Zurich expressed himself thus a propos of "anthropoflux R": "It is known that at the time when certain poor electric conductors are submitted to the influence of physical agents, these substances become good conductors and remain so as long as the influence lasts. For example, the air is a gas mixture which conducts electricity only when it is submitted to the influence of an

ionizer (voltaic arc, x-ray, radioactive substances, etc.).

Müller's research led him to admit that the human body emits a physiological-physical agent of various natures, heat, light, etc., at frequent but irregular intervals, and that it causes variations analogous to the conductivity of certain substances.

Pending further knowledge, we could call this agent "Anthropoflux R" (R corresponds to the two aforementioned essential characteristics of this agent: radiation, modified resistance). This name facilitates the exposition of its property and is justified at least to that extent.

Of all the body surface, it is the inside of the fingers of the left hand which in general emits "anthropoflux R" most abundantly. The extremity of the fingers and the nails emit it with lesser intensity.

A muscular effort made by the subject during an experiment can often provoke the emisson of "anthropoflux R," if it has not been hitherto forthcoming. Also an effort of the will seems to act in analogous manner. Some subjects have been known to have the power to emit "anthropoflux R" on command.

Anthropoflux R crosses a large number of organic and inorganic barriers: for example, animal skin (gloves), gelatine, collodion, mica, glass, copper, tin, cardboard, etc. Paraffin intercepts its radiation. The metallic barriers crossed are generally about a tenth of a mm thick.

The substances whose resistance is modified under the influence of Anthropoflux R are the air, silk, gum lacquer wet filter-paper.

To reveal these various properties, Müller used four ingenious methods. We shall describe only the first one here.

A small condenser formed by two silver plates about 5 x 30 mm and separated by an air space of 0.2 to 0.3 mm, is inserted in series with a quadrant electrometer in a voltaic battery circuit of about 40 volts. The electrometer discharges slowly, thanks to the excellent insul-

ation of the condensor plates whose capacity is insignificant. But as soon as the internal face of the fingers of the experimental subject's hand approaches the condensor, without touching it, the charge on the electrometer accelerates, in general in a continuous manner. Sometimes its charge rate fluctuates; one notes then that the charge of the electrometer is only produced at rather long intervals.

First of all, the electrometer can be charged. It then discharges very slowly, unless the fingers are drawn to within a few millimeters of the rim of the small condenser.

One notes then either an increased discharge rate, or a fluctuating discharge rate.

"From the moment," concludes Farny, "that the emission of anthropoflux R is influenced phsyiologically and psychophysiologically, it seems to lend itself to the control of various biological functions of the human body."

After having described his methods, Farny states his results as "the demonstration of the existence of an agent, whose source is in the human body and whose essential characteristic is to momentarily modify the conductivity of certain substances." And he concludes: "One can ask if these considerations are not premature, but one must also remember that if one does not spread knowledge, even superficial, of a discovery, one surely deprives it of the developments and refinements by collaborators."

Typical of this is the psycho galvanic reflex phenomenon described by Veraguth under the name "psycho galvanic reflex" consisting of a galvanometric deviation, provoked by mental phenomena, when the subject is connected in series with an electric circuit.

This phenomenon is completely relevant to the electrical properties of the body; one can place an individual in an electric circuit

formed for example by a storage battery, a subject and a galvanometer, in a manner whereby the two electrodes of the circuit are applied to the palm of the subject's hand. By appropriate means, one can cause the galvanometer to return to the resting position, or almost. In this method, the hand of the subject represents only an electrical resistance. Or, the system being thus set up, one provokes in the subject an emotion, for example, saying that he wants to prick him, and the galvanometer deviates sharply. It is interesting to observe that the threat of a prick has a much more intense effect than the actual prick and such a threat remains efficacious, even when the subject knows well that it will be very slight, or will remain only a threat.

"Speak," wrote a physiologist in a layman's scientific journal "in these circumstances to a youth of a letter from a fair hand, speak to a student of an imminent exam, or to a destitute soul of the pawn broker's office, and you will see the luminous spot reflected on the galvanometric mirror deviate rapidly. The cause of this galvanometric deviation lies in the lowering of electrical resistance, here is the "difficulty," here is the problem that is still far from being solved."

Pieron adressing the medico-psychological society in Paris on the "psycho galvanic reflex," stated that this was actually discovered by the engineer Müller, whose collaborator Veraguth became, and that Veraguth was a successor to Vigoroux, Puifontaine, Fere, Sommer, etc.

Pieron studied the phenomenon at length as Jung, Peterson, Binswanger and Boris Sidil had already done, and from his experiments come all of the following conclusions:

"Only emotional phenomena are capable of provoking the apparent lowering of the organism's resistance to the passage of electric current; all the other factors act only as determinants of an effective disturbance; repetition weakens and finally annihilates all galvanic

effect, at the same time, as this disturbance is attenuated and suppressed.

The causes of the phenomenon are very obscure: it is not a physical phenomenon, nor a glandular phenomenon, nor a production of electromotive force, for even though such a force could be produced under the influence of muscular contractions, it could only be observed on extremely sensitive galvanometers (Waller, Boris Sidil). Heumann's experiments demonstrated the existence of a reaction current near the organism, crossed by an exogenic current and opposite in direction to this exogenic current; such a case must involve a weakening, under the influence of the emotion, of the intensity of the reaction current (which could explain the apparent increase in resistance which is progressively overcome each time that a current is made to cross the organism).

From the point of view of the applications described with enthusiasm by Veraguth and Jung, the psycho galvanic reflex is shown to be useful neither for the discovery of real anesthesia, nor for the demonstration of the existence of simulations, because they are not provoked by sensory phenomena, but only the the emotions. From the affective point of view, the methods based on the recording of vascular changes prove to be particularly delicate in practice, extremely dangerous in interpretation and hardly useful in psychiatric medicine."

Other people, still illustrating some of the more conspicuous somatic manifestations of emotive phenomena, hold that the psychogalvanic reaction is due to small changes in the sweat glands under the skin.

Boris Sidil and Louis Nelson inquired into the basis of the psychogalvanic phenomenon and tried to reconcile the critical with the experimental point of view.

From the critical point of view, these two authors observe that Tarchanov is considered one of the prime investigators in the discovery of the interesting fact that psychic states cause galvanometric deviations. According to Tarchanov, all the psychic processes, sensory, emotional and also the purely mental processes, such as imagination and calculation, are accompanied by galvanometric deviations. He observed large deviations of the galvanometer apparently caused not only by sensory stimulation, related to states of commotion and emotion, but also by simple recollection and representation of these states. Intellectual processes, ideas, and mnemonic imaginings are sufficient to reflect in the galvanometric mirror and to cause sharp deviations.

As a result of his investigations, published in a brief preliminary communication, he conjectured that the deviations could be due to cutaneous secretory changes. He believes that psychic activity promotes skin secretions which in their turn produce the marked deviations observed in the galvanometric mirror. Charles Fere can only be considered as one among the many pioneers who pointed out the influence of emotional states on galvanometric deviations. According to this investigator, the deviations are due to variations in the resistance of the body; in other words, Fere holds that emotional states lower the electrical resistance of the body. The thesis of the lowering of the body's resistance was accepted without criticism by many investigators. The galvanic deviations would then be due to the lowering of the electrical resistance by the secretory agent of the skin, triggered by psychic activity.

Sticker rejects Tarchanov's hypothesis that the effect of the skin and the action of the sweat glands is the cause of the observed galvanometric deviations during psychic states. He advanced the hypothesis of

circulation, that is that the galvanic phenomenon is the effect of circulatory changes in the capillary blood vessesls, changes induced by psychic states in general, and emotional states in particular. In this regard, Sticker agrees with the French investigators who do not hesitate to endorse the hypothesis of circulatory factors. The galvanometric disturbances are supposed to be the effect of disturbed circulation, which lowers the peripheral tension.

J. Vigoroux, experimenting on his clinical cases, rejected the assertion that the lowering of the resistance is due to skin secretions; he ascribed the electric perturbations to the variations of resistance of the circulation of the blood, especially of the capillary blood vessels; the cause of these variations in electrical resistance is not known, but it is probably the increase and decrease of the blood concentration influenced by the state of mind and particularly by the emotions.

C.G. Jung of Zurich and his collaborators, Peterson and Ricksher, did a series of experiments on a number of persons both ill and healthy. They confirmed the presence of the so-called "galvanic phenomena" which accompany the various mental states under observation. They found different disturbances in different mental states. Jung considered the galvanometer as a precious instrument of study, analysis and discovery of the so-called psychophysiological complex otherwise called the "psychoanalytic method." Some of the followers of the German school saluted the psychogalvanic proof as a new method of study of mental disease in general, and hysteria in particular. The application of such a method of inquiry to criminology, though liked by some people, nevertheless implies the complete denial that the inhibition of the emotive factor, – psychic agent sine qua non of the phenomenon – can be voluntary in criminals and even in normal subjects.

Jung and his collaborators contributed much to the clarification of the causes of galvanic phenomena, but they accepted Tarchanov's hypothesis that the galvancmetric disturbances were the effect of skin secretions. According to the Zurich investigators, mental activity with its accompanying states of commotion, gives rise to the sweat-gland secretion, which lowers the electrical resistance, this being the cause of the observed galvanometric disturbances. This conclusion is only a plausible conjecture. It is probable that a number of other factors concur in the determination of the galvanic phenomena, such as circulatory changes, changes in the central nervous system, and especially changes produced by mental activity and their accompanying states of commotion in the sympathetic nervous system.

To cite Jung: "If tactile, optic or accoustic irritations of a certain force are applied to a subject, the galvanometer will indicate an increase in the quantity of current; for example a lowering of the electrical resistance of the body." At another point, Jung and Peterson say: "the change in resistance is caused either by the saturation of the epidermis with sweat, or simply by the filling of the canals of the sweat-gland system seems to lie in the sympathetic nervous system.

Ricksher and Jung wrote further: "The sweat glands seem to have more influence than all the other parts in the reduction of resistance. If the sweat glands cause the stimulation, there would be a thousand liquid connections between the electrodes and the tissues, and the resistance would be quite lowered. Experiments were made putting the electrodes on different parts of the body and it was found that the reduction in resistance was more noted in those points where the sweat glands were more numerous. It is well known that stimuli and emotions influence the various organs and the glands, the heart, the lungs, the sweat glands, etc. Heat and cold also influence the phenomenon; heat

causes a decrease and cold an increase in resistance. In view of these facts, the action of the sweat glands seems to be the most plausible explanation for the changes in resistance."

Veraguth labored assiduously and patiently for a number of years on what he called "the galvanic, psychophysical reflex." He eliminates circulation and the effects of the skin as causes of the "reflex," but arrives at no definite conclusion in regard to the cause of the galvanic deviation during sensory and emotional processes. Veraguth believes that his "galvanic reflex" is due to variations in bodily conductivity. He believes this phenomenon to be somewhat different from that described by Tarchanov and others.

The attitude of Sommer toward the galvanic phenomenon is rather negative. He ascribes the galvanic deviations to the effects of contact between the skin and the electrodes, and also to changes in the resistance of the epidermis. An involuntary increase or decrease of the pressure on the electrodes would change the points of contact, and the skin's resistance, thus giving rise to galvanometric variations.

It is clear that Sommer does not consider the galvanic phenomenon as the effect of processes which take place within the organism. The galvanic disturbances, according to Sommer, are rather of a purely physical character, and depend on the extension of surface contact, and upon the changes of the skin's resistance. Sommer's studies should certainly be taken into consideration, first in order to establish a definite relation between physicophysiological processes and galvanometric deviations. The usual method of most investigators, that is the employment of metal electrodes upon which the palms of the hands are pressed, can lead to such interpretations, and for that reason, the galvanic reaction is not really established until this argument is answered.

Jung and Ricksher do not answer Sommer's argument when they say: "The changes in resistance are not due to changes in contact (such as pressure on the electrodes), for it has been shown that when the hands are immersed in water, which acts like a connection to the electrodes, the resistance changes still take place. Pressure and involuntary movements produce entirely different deviations from those which are customarily obtained as results of effective stimuli."

Rinswanger's techniques in his detailed study of the galvanic phenomenon, do not differ substantially from those generally employed by Jung and his collaborators, with whose conclusions about the nature and cause of the galvanic phenomenon, he agrees.

He agrees with Tarchanov that the cause of the galvanic phenomenon is the secretion of the skin. Sidi and Kalmus after a series of experiments, confirmed the relation of the "galvanic phenomenon" to certain psychophysiological states, and demonstrated in various experiments that the effects of contact, changes of the skin and circulatory disturbances can be entirely excluded as causes of the psychogalvanic phenomenon. Moreover, the same investigators showed that what can be called the galvanic reaction has nothing to do with lowered resistance, be it corporeal or cutaneous, produced by psychophysiological processes; they proved that resistance can be excluded, that the phenomenon is entirely a function of the electromotive force caused by the action of psychophysiological processes, triggered by various sensory stimulations, external or internal.

To cite the original paper: "Our experiments prove that the cause of the galvanic phenomenon cannot be assigned to the skin's resistance, nor to temperature variations, nor to circulatory changes with possible changes in the concentration of body fluids. Since the electrical resistance of a given body depends upon two factors — temperature and

concentration – the elimination of both these factors in the present case excludes the body's resistance as the cause of the deviations. Our experiments prove then without error that the galvanic phenomenon is due to mental and physiological processes, and cannot be assigned to variations in resistance either in the skin or in the body. Resistance being excluded, the galvanometric deviations can be due only to variations in the electromotive force of the body."

Boris Sidil and Louis Nelson believe that they have definitely determined the actual cause of the observed galvanometric deviations concomitant with some psychophysiological processes and submit the following conclusions:

1 – The galvanometric deviations are caused by psychophysiological processes (but not purely mental processes) under the influence of various stimulations.

2 – These galvanometric deviations which we call "galvanic reactions" are not due to variations in resistance, either of the skin or of the body.

3 – The galvanic reaction is the result of the variations of the electromotive force produced by psychophysiological processes activated by internal and external stimuli.

4 – The cause of the galvanic reactions cannot be assigned to circulation, nor to secretory current, either of the skin glands or of other glandular organs.

5 – The central nervous system and the sympathetic nervous system are similarly excluded as factors relevant to the manifestation of the galvanic reaction.

6 – The galvanic reaction is completely a muscular phenomenon due to the contractions, tensions and effort of the muscle fibers under the influence of various psychic, sensory, physiological, chemical,

thermal, electrical or mechanical agents.

7 — The galvanic reaction is principally produced by the muscles within the circuit.

8 — The prolonged activity "peristalsis" gives rise to galvanic deviations which are due to the contractions of muscles involved in the process of "peristalsis."

9 — The galvanic reaction diminishes and disappears completely with the repetition of the same type of stimulus.

10 — This diminishing or disappearance of the galvanic reaction with the repetition of the stimulus is only due to the diminution of sensitivity upon repetition of the same stimulus.

11 — Moreover, the diminution of the galvanic reaction can also be caused by the gradual fatigue of the muscles in the circuit, resulting from a prolonged stimulation.

12 — The heartbeat (like the contractions of all other muscles) gives rise to galvanic deviations.

Brugmans used the psychogalvanic phenomenon to study the "passive state" of a sensitive subject, and relative to that particularly interesting state of consiousness (really autotrance with a particular degree of cerebral tension) he noticed deviations more marked than those usually provoked in the normal state.

The mechanism underlying the psychogalvanic phenomenon is still undeniably clouded in obscurity. But it does shed some light upon the changeable bioelectric reactivity of the human organism, particularly in relation to the psychic functions which we know to be located in the cerebral cortex.

We are approaching the time of Berger's and Adrian's experimental attempts to confirm the electrical activity of the human brain.

Coming closer to my experimental research in cerebral psychobio-

physics, which led me to the discovery of radiant electromagnetic phenomena of the human brain in states of intense psychosensorial activity, I shall record the following data as a conclusion to this introduction for the orientation and convenience of the reader.

My experiments called upon Robert Desoille, radiotechnical engineer who conducted experiments along three different lines.

First, he sought to detect wave emissions from a subject with a receiver made simply from an antenna joined to a galvanometer, with the subject placed nearby, but not in contact with the antenna. He observed a slight deviation in one case out of three. Here we note the low efficiency of the simple antenna, when compared with my oscillators, for appraising the psychic conditions of the subjects under experiment and for keeping account of the events; Desoille himself objected to the low sensitivity of the galvanometer used and finally replaced it with a string type.

The second group of experiments was designed to test the possibility of the subject's reception of hertzian waves.

"A vertically placed antenna is excited by a Ruhmkorff coil.

The antenna with the transmitter is placed in a room, the subject 5 or 6 meters from there in another room from which he cannot hear the humming of the transmitter.

The set transmits for periods of 30 seconds at random intervals. Under these conditions, the three subjects with whom we were working clearly perceived the emission and lit the signal lamp within the 30 second interval on the average of 9 times out of 10."

The subject whose limbs must be muscularly relaxed and whose mind must be as empty as possible with his attention concentrated only on the eventual organic sensations, gives notice at the moment of the emission of the radiowaves, of a slight impression of electric discharge in the upper and lower extremities.

Like the frog attached to an antenna whose muscles contract with the passage of hertzian waves.

Desoille perfected the experiment with this addition:

"The subject is attached to a sensitive galvanometer by applying two non-polarizing electrodes, after the model of Doctor Bourguignon, one in the palm of the left hand, the other on the forehead. Under these conditions, a slight difference in potential manifests itself which causes the galvanometer to deviate; we wait for the deviation to steady itself, and then we emit the hertzian waves.

For a certain power of emission, we note a variation in current of about 10%; this variation seems to be produced without appreciable delay. After the passage of the wave, the current goes back to the same value as before the emission."

This is basically a psychogalvanic reflex, but provoked by hertzian waves directed at the subject.

The only positive conclusion which Desoille was forced to recognize experimentally was "the influence of short hertzian waves on sensitive subjects."

And we come to Desoille's third group of experiments which confirm exactly the conclusions of my research by an indirect route, since they prove that the propagation of hertzian waves is modified not only by the simple presence of a subject placed between the short wave oscillator and the receiving antenna, (that would be normal) but also that their propagation is modified by variations in the states of consciousness of the subject. We should add here that placing a subject between the transmitter and the receiver should produce a phenomenon of absorption, manifested in a diminution of the current which runs through the galvanometer. Instead, the psychic variations, which in Desoille's observations are reduced to a psychosensorial cerebral common denomina-

tor, cause an increase of the current in the receiving antenna.

Desoille availed himself of a special transmitting apparatus on the Mesuy scheme for waves of about 5 meters.

The experiments developed thus:

"At A is located a transmitter. At B a seated subject. At C, a vertical antenna joined to a galvanometer G by a connection through a galena diode g, to rectify the high frequency current induced in the antenna. The apparatus is regulated so as to obtain a deviation sufficient to the galvanometer.

When the subject arrives in a certain region near the apparatus, a diminution of current is produced, measured by the galvanometer, due to a phenomenon of absorption. If the subject remains in a normal state of consciousness, the deviations of the galvanometer correspond simply to slight variations in current on the transmitter plate, read on a milliammeter.

When the subject concentrates his attention, after having put himself into the most passive state possible, we observe that for a change in the state of consciousness, corresponding for example to a strong emotion or to a change in the mental image upon which the subject fixes his attention, the galvanometer deviates abruptly, indicating the passage of a current in the antenna which is about 1.5 times the current observed for the normal state of consciousness.

The moment of the deviation on the galvanometer coincides rigorously with the instant when the subject announces his emotion or with the apparation of a new image. The change observed ceases at the moment when the subject announces that the emotion has ceased or that the image has disappeared."

The author, reporting examples of definite indications, makes a critical examination of these experiments, with possible variations in

capacity in mind, necessary precautions which must be mentioned and which Desoille and I followed scrupulously.

Desoille who before setting foot on experimental terrain had insisted on the danger of error arising from variations in capacity due to excessive movements of the experimental subjects in the vicinity of the apparatus – this was justly cautious – but he had to admit on the basis of his own experience that:

"One cannot obtain values that we have observed for the rather abrupt changes in the states of consciousness of the subject, just by provoking deviations in the galvanometer by movements of the observer or the subject. It seems therefore that there is a phenomenon related to the states of consciousness in these experiments, especially if one takes into account the coincidence between the moment of the deviation and the moment that the subject changes state."

These important last experiments of Desoille confirmed similar ones by Skirtzky and Lermontoff who wondered about the possibility of a secondary radiation.

Desoille concludes that the experiments described could contribute: "to the refinement of a technique inaugurated by scholars like M. Lakhowski and Professor Cazzamalli, to mention only those two. These experiments will bring to light a new order of phenomena at once biological and psychological, and will help to solve, at least partially, the problem of the human personality."

I want to mention finally that the periodic reactions of the nervous centers studied by Astwald, Kistiakowski, Frölich and Lasareff, are accompanied by periodic variations in electromotive force of these same nervous centers, which variations make possible the emission of electromagnetic waves from the functioning nerve cell. Lasareff writes on this subject:

"Concerning this, we wish simply to point out that, as a matter of principle, it should be possible to track down the material processes which accompany these physical events in the form of electromagnetic waves. Biophysics must keep this problem in mind for it could become one of its most interesting problems.

We must point out directly the great difficulties which confront the demonstration of these electromagnetic waves, since in any case, one is dealing with very weak waves which undergo further weakening in their passage across animal tissue conductors."

This is an essential point of the biophysics of the brain, exactly in the experimental line.

Nor must we forget Ruffini's idea that nervous currents must follow the laws of cellular polarity, (as must the nutritive, anabolic and catabolic currents) that they must create a magnetic field round themselves, that they must consitute actual electromagnetic currents, as do all potentials in motion.

And why could not, nay should not cerebral action currents have radiant activity? Is it impossible, as Brugia correctly observes, for the brain "to dispose of alternating currents, electric capacity, auto-inductive circuits — i.e., everything necessary to produce oscillatory discharges and the consequent electromagnetic waves?"

Here then is the reason for the existence of such large numbers of nerve elements and cortical cells (more than five and a half billion); they are storehouses for the psychological requirements of receiving and storing many electrons, according to the physical law that the electrical capacity is proportional to the quantity of material decomposed.

Only such a fantastic abundance of elements operating harmonically can yield the prodigious elaboration of the innumerable, varied, extensive and profound psychic dynamisms.

"The fact is – according to Bechterew – that each cerebral center is a storage cell of energy which permits the center to remain inactive until that energy has attained a certain degree of tension, it simply stores the current which continues to flow into it."

Electrical current in the brain creates a magnetic field round itself, as does any flux of electricity, with induction on inactive diastaltic arcs.

Lasareff explains the reinforcement of auditory sensations occurring along with irritations of the eye on the basis of the theory of electromagnetic radiation: reinforcement discovered and thoroughly investigated by Urbanschitsch.

I can see no more persuasive interpretation than this for certain other phenomena like those of colored hearing. Loeb's remarks concerning associative memory, that is the processes of sensorial reasoning, have become significant for the theorizers of symbolic histology and the humoral mechanists, who are today plurimechanists:

There is a tendency today to consider the anatomical and histological study of the brain as the most promising way to analyze these functions. It seems to me that to try to account for the mechanism of associative memory by histological or morphological methods is like trying to explain the dynamics of electric phenomena by the microscopic study of the transverse sections of a telegraphic wire or by the enumeration and topography of the telephonic connections of a large city."

In reality, when the reflexes are relayed to the sensory apparatus, some generic property of conductivity appears between this apparatus and the expressive instruments, while coordination, memory and association assume the value, not of particular entities, but rather of a composition of forces.

When sensory excitations travel in a cellulipetal direction along

the pathways of projection to the sensory cortex, when they travel from the motor cortex to the motor or glandular organs along the pathway of expression in a cellulifugal direction, the energy in play does not provide sufficient reason to deem it either of a specific mechano-humoral nature, or of aspecific electric and electromagnetic nature, since only the sense-receptors, t.. glands and the organs which express emotion appear to be specific.

On the subject of nervous functions and nervous energy (we must not deny the electronic aspects of neurocellular-fibrilary life, mixing it with some other aspects) to ignore the harmonious complex of experiment and argument, of all electrobiology both classic and modern, to ignore the electronic theory of matter and its accompanying experiments, is to support antiquated tenets with artificial arguments.

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[Footnotes]

19 Il valore diagnostice dello stenometro di Paul Joire [The Diagnostic Value of Paul Joire's Stenometer], Revista di Psicologia [Psychological Review], Published by Zanichelli, Bologna, 1913.

EXPERIMENTAL RESEARCH IN CEREBRAL PSYCHOBIOPHYSICS

FIRST EXPERIMENTAL PHASE FROM 1925 to 1932

Toward the end of 1923, I drew up a detailed plan of research aimed at studying – from a particular psychobiophysical point of view – that group of metapsychic phenomena which form a part of subjective metapsychics (Charles Richet) already known under such antiquated or erroneous names as lucidity, clairvoyance, psychometry, now gathered with greater rationality and propriety of scientific language, under the heading of telepathy (Myers) accidental and experimental cryptesthesia (Richet), or giving a greater largesse to Boirac's definition, telepsychia(Osty) or telepsychism (Cazzamalli).

The experiments were begun toward the end of 1924.

In 1925, there came an opportune moment for writing a few notes on these experiments, for two orders of reasons: to establish the priority of my research, and to announce therewith my first positive results, and to encourage other workers to undertake experiments along these lines.

PSYCHOPHYSIOLOGICAL AND PSYCHOBIOPHYSICAL HISTORICAL PRELIMINARIES

From the XVIII Century onward, metadynamic hypotheses concerning the existence of a fluorescent energy of the human body under given conditions have followed one on another. It is becoming more and more clear that the source of this energy is the nervous system, is the brain.

We can compare electrobiology, whose granite foundations were laid, as I mentioned in the introduction, by Galvani's discovery of animal electricity, to our historic buildings; after the first constructive

impetus, decades of stasis and uncertainty were interspersed with years of feverish resumption of activity, so that the works were finally completed and the succeeding centuries were left with admirable churches and palaces.

Similarly, with the inquiry into the bioelectric properties of organs and tissues; periods of splendor, when experimental advances were made, were interspersed with periods of lethargic inertia.

If Volta seemed to have dealt a death blow to animal electricity by the contrast of his ingenious design of the battery which he himself called the artificial electric organ ("because it is founded on the same principles as the natural organ of the electric fish and its first model was even similar in form to this organ") and which today has reached such portentious derivation, the battery – as if in reparation – became the means for revealing the most hidden and delicate electromagnetic phenomena of the animal organism.

During the predominance of that narrow mechanicism which rendered research, deductions and inductions opaque, the tissue most typical of response to stimuli – I mean nervous tissue – due to its exquisite functional dignity, came to see its energy described as being of a particular nature and as being positively specific, as it circulated along its networks, diffused into all organs and tissues, or vibrated in its stimuli-emission and reception centers, as it showed its sensitive, motor, sensory and psychic elaborations.

The specificity of nervous energy was confused with the specificity of the glands, the motor organs and the sense-receptors.

But when the excitations leave the nerve endings of the sense organs and travel in a cellulipetal direction along the projections to the cortex, when they travel from the motor cortex to the glands or motor-organs along the intracerebral expressions in a cellulifugal direc-

tion, there is no reason to suppose that the energy involved is specific and of mechano-humoral type; nay, all the evidence points toward its being aspecific.

In reality, while the bioelectric nature of the reaction mechanism of cellular protoplasm in general and nervous irritation in particular, was becoming more precise – one can now state that there is no manifestation of life without the production of electric phenomena – the series of discoveries and theories about the dynamics of nervous action appears to be harmonious.

The ever more numerous and persuasive proofs that nervous energy is aspecific, and of electric and electromagnetic nature, remind us of Galvani's enlightened observations about the heart which the Weber brothers later identified as inhibitions due to electromagnetic excitation.

Nobili, Matteucci and later DuBois-Reymond and Waller, brought electrobiology resolutely forward to the discovery of the electrical current in nerves, muscles and tissues in general, in their active, resting and changing states.

From Helmholtz to Athanassiu-Richet, research continued on the conduction rate of nerves and on the electrical action current of the heart and brain by excitation of the labyrinth (Camis); later Horsley, Tschijew, Nemminski and collaterally, the able experimentalists, Newton, Haller, Matteucci, Helmholtz and Pawlow aided in the development of the ionic theory of nervous excitations, as did the research of Ostwald, Kisjakowsky, Frölich Lasareff, of which we shall speak more in this chapter.

We must mention observations of Branly(*) (though he was not known mainly as a neurologist) on the similarity of nervous and electrical wave-propagation; this coincides with Charles Henry's avant garde psy-

chobiophysical concept and this homage to the law of flux and reflux restores some value to the convictions held by many scientists between 1700 and 1800, that nervous manifestations were only a biological form of electric phenomena.

But stepping aside from these theories, and placing myself from a strictly experimental viewpoint, I was interested in seeing if the physical conditions of electromagnetic charge and current in functioning nerve centers, that is the cerebral action currents could show radiant activity in specific cases.

Even more so since I have never refrained, nor do I yet, from considering the possibility that radiation is due to the vast intracerebral conductive network of large associative zones, which become engaged (together to a large neural mass of cortical elaboration), whenever the cerebro-psychic phenomena of distinct intensity are in play, which impose particularly upon the psychosensorial activity of the brain.

These phenomena are: reverie, artistic creativity both visual and acoustical, of mnemonic evocation of high sensorial intensity, dreams, hallucinatory visions either spontaneous or provoked, and morbid hallucinations.

One must remember that one can think of hallucinations only if one bears the sensory and sensitive chart of the cortex in mind. And though it be true that "to indicate the cerebral locus of a phenomenon is not equivalent to explaining it," it is also true that the cortico-sensory aspect of hallucination is incontestable.

On the other hand, the visual predominates to quite a degree over the acoustic in telepathic hallucinations (76%) which is quite different from other hallucinations; telepathic hallucinations have such intensity and liveliness as to be indistinguishable from reality, so that they impress the subject profoundly and lastingly, which common transi-

tory hallucinations rarely do.

The nervous wave, says Bianchi,* stores the synthesis of matter and of its force, as the nervous system transforms cosmic energy into psychic equivalents. I would add that these psychic equivalents are aspects of fundamental energy; man is thus offered, as he goes along in tiny steps from the abyss of ignorance, acquiring partial knowledge, all that we like to distinguish and to place under the headings of physical and metaphysical, psychic and metapsychic.

The metadynamic hypotheses, as I have mentioned in the Introduction, go from Maxwell's corporeal rays (1675) to Crooke's psychic force or Joire's fluid force (1894), to Lombroso's irradiating cerebral force, to Patrizi's cortical vibrations, and to Morselli's human biopsychical radioactivity (1908) – here the hypothesis assumes great precision.

The attempts to prove the existence of this supposed force or radiant energy of the human organism, with instruments, go from Collonque's old bioscope, through many other similar apparati, up to Crookes's radiometer and Joire's stenometer. I used this last apparatus only until 1912 in experiments performed in the celebrated laboratory of experimental psychology of the mental hospital in Emilia Street, directed by Guicciardi, with results which led me – with two positive conclusions – to express dissent from Joire's diagnostic inferences, as one can see clearly in the Introduction.

In fact, the serious objection which weakens the results of the experiments performed with such apparati, is that bodily heat and bodily electricity influence the instruments, that they have been definitely shown to be sensitive to caloric and electric radiations, to mechanical impulses, though perhaps also to certain unknown biopsychical radiations.

At the same time as the problem of the causes was being phrased, the era of the most serious and probing experiments in that complex and tormented metapsychic phenomenology were beginning.

Cesare Lombroso, Enrico Morselli, Rocco Santoliquido, Bottazzi, Patrizi, Bozzano, Machenzie, etc., in Italy; Charles Richet, C. Flammarion, Paul Joire, De Rochas, Maxwell, Geley and Osty in France; Ahsakoff in Russia; Ochorowicz in Poland; Crookes, Wallace, Myers and Lodge in England; Zollner, Alrutz, De Schering-Notzing in Germany; William James in America, and others are still inquiring, hypothesizing, experimenting courageously, defying debilitating scepticism, ignorance and the poorly hidden or open aversion of official science.

This severe experimental travail led to the scientific systematization of Metapsychics.

Everyone knows that the reality of that imposing group of phenomena which constitute subjective metapsychics is now beyond any serious crtical discussion.

Richet said at the International Congress of Physiology in Edinborough:

"Physiologists and physicians, would you dare to suppose that you have completed the physiology of the brain? That there is nothing more to discover? And that you have sketched out all of its possible ramifications? The brain is a much more complicated machine than we naively suppose. Why should not this marvelous machine be able sometimes to perceive vibrations which go unnoticed by the consciousness? That, my dear colleagues, is physiology."

And Osty:

"The experimental study of telepathy would lead to an extension of psychophysiology and psychology which is hard to imagine.

What one can undertake is the study and explanation of psychic

and physiological determinism, by which a certain physicochemical change in the cerebral cell system functioning in one person, reproduces the same mechanism in another person, and what form of energy the agent transmits to the perceiver. We would then give ourselves to the study of the brain as 'emitter' and 'receiver' of still unknown radiations."

Now with respect to the attempts at experimental demonstration of "radiations" emanating from the human body in given circumstances, one cannot but see the poverty of technical means of the time, in contrast to today's noticeable enrichment, which has been prodigious in certain realms of applied physics.

New concepts with regard to the constitution of matter have dissolved matter into energy in a certain sense, and energy into electricity.

The structure of matter seems today to rest on the existence and properties of electricity. An important advance in the knowledge of matter was the consideration of liquids not as continuous fluids, but as having an atomic constitution; a similar progress in the study of electricity led to the recognition of its granular structure.

After the prodigious discoveries of Galvani and Volta, from Faraday to Maxwell, Hertz, Lorentz, Becquerel, Curie, Rutherford and Bohr, came the great rise in knowledge of the constitution of matter via the studies of electricity. Theories bountiful with experiments, experiments bountiful with theories and working hypotheses, gave us the solar model of the atom with its positive nucleus (proton) around which the negative electrons revolve. Planck's "quantum" theory (in 1901 which established that all radiations are emitted in "quanta") and Dirac's theory of the electron followed; these theories along with that of the neutron (a proton with a zero charge) reduced matter in the last analysis to granules of electricity. I record here the great physicist De Broglie's exposition made at the Congress of Biology in 1937 in honor of Galvani:

"The hypothesis that now seems to prevail is that which considers the proton and the neutron a two states of the same particle; the passage from the proton to the neutron state takes place with the creation and emission of a positive electron, while the inverse passage from the neutron to the proton state is effected with the creation and emission of a negative electron."

These quite recent concepts concerning electricity and the intimate role of the elementary particles of electricity in the architecture of matter, flow into the phenomena of creation, leading little by little to the inside of that solar system of electrical particles, neutral, positive and negative, which is the atom. Modern atomic physics outlines the forces unleased by the bombardment of the atom; atomic energy marks a great and terrifying turn for humanity.

Where there is "creation," there is Bios, there is life.

Now this elementary energy which produces physicochemical phenomena, can it be the source of life?

If we turn to the more troublesome biological problems and to the constitution and the architecture of living matter, we come head-on into the cell, which is still thought to be the fundamental unit of life, composed of protoplasm or cytoplasm and a nucleus, surrounded in most cases by the cellular membrane.

As happened with the atom, which was thought to be the primordial element of matter in a physical-chemical sense, until we succeeded in penetrating into its electric particle constitution, so it happened with the cell which we succeeded in seeing as composed in reality of smaller bodies which are called micelles. Protoplasm is in fact an aequous solution containing colloids, crystalloids and substances in suspension. In its colloidal state, matter is organized as micells which exhibit what we call brownian movement, and these are made up of gran-

ules packed tightly together. Granules and involucres carry unequal electric charges and opposite signs. The micelles resemble the atom in constitution, since they are formed by granules comprising a certain number of molecules. Silvestro Baglioni, the illustrious physiologist of the Roman Atheraeum recently deceased, asked these interesting questions which constitute a veritable exposition: "How many centuries did it take to learn the microscopic cellular structure of tissue? And can we say today that with our improved microscopes, we have reached the extreme limits of the structural constitution of morphological elements, if we have not yet managed to see clearly the principal colloidal and protein molecules?" The micelle is not in itself living matter, inasmuch as there are nonliving micells; but living beings are made up of micelles, nor is there any cell without micelles.

We arrive here at the extreme limit between the physicochemical phenomenon and the phenomenon of life. Much like the atom which appearpeared to be stable, the micell is destructible; since it is made of living matter, it is subject to aging, it is doomed to dissolution and cannot be reconstructed. This is what makes a cell a living being, if we still agree that some of the phenomena characteristic of life are: mobility, irritability, that is response to external stimuli, nutrition, reproduction. The amoeba, unicellular micro-organism, deforms itself according to its surroundings; it advances or withdraws with its pseudopods, put forth at the necessary moment, which then disappear to reappaear again accerding to stimuli or to vital necessity. Here we see embryonically the functioning of that eminently receptive and elaborative system, so responsive to the outside world, which is the central nervous system.

Nervous energy – and thus we reach the unit source of life – is not that same fundamental energy developed by the dynamics of live cell polarization (physico-chemical processes of nervous action) which can be transformed into other forms of energy and transmitted from a distance according to a bioelectric dynamism. (Skerington, Lugaro, Kappers, Tello).

When I decided to do, or rather to redo some research with new instruments, aimed at experimentally evaluating the effective value of the hypotheses concerning the "human, biopsychical radioactivity" according to the happy expression of Enrico Morselli, which was manifest in specific psychic (cerebral) conditions of the human subject, I firmly decided to use the direct method. Learning a bit later of Lasareff's work, and that he employed the indirect method exclusively, observing the periodic currents generated by the nerve centers in action, I became even more firmly decided to use a new experimental orientation for my research on these electromagnetic waves by the direct experimental method.

Lasareff stated the problem to the Russian Academy of Sciences in 1923 in a communication entitled: "La funzione periodica dei centri nervosa e sulle onde elettromagnetiche, che accompagnano la funzione nervosa [The Periodic Functions of Nerve Centers and Electromagnetic Waves Which Accompany the Nervous Function], and in his paper we read:

In our works we have indicated that the ionic theory of excitation shows that the nerve centers must function periodically, and that this function depends upon periodic reactions which are produced in the nerve cells. These periodic reactions, which M.W. Ostwald, M.W. Kistjakowscky and other scientists studied thoroughly must be accompanied by periodic variations in electro-motive force. As we know, according to the electromagnetic theory of Maxwell, variations in electromotive force must be accompanied by electromagnetic waves, whose propagation

rate in space is equal to that of light. According to what we have said, the existence of variable electro-motive force at a point in space leads immediately to the existence of an electromagnetic wave, and can be considered as an indirect proof of that wave's existence. In Fröhlic's recent and remarkable book, it is shown that the electrogram of the eye during an illumination of short duration, shows in the best possible way that periodic oscillations can be recorded with sufficient precision on an Einthoven galvanometer. Fröhlich indicated in his book that this fact could become very important for the theory of vision. We can see this fact explained in the following manner. We know that the retina forms a part of our brain and contains nerve cells which can be considered as the prime centers of vision, located in the retina. The function of the centers causes a periodic reaction which is accompanied by a periodic electromotive force and these electric phenomena have been observed by Fröhlich. According to our theory, the experiments mentioned by Fröhlich are an excellent basis for the theory of the emission of electro-magnetic waves by functioning nerve cells."

This supports our own Ruffini's integrative concepts concerning the production of nervous currents of a magnetic field, so that they seem to constitute real and true electromagnetic currents. Nothing then contradicts the physiological possibility that in the human brain, all electrical current can act as any flux of electricity acts, causing a magnetic field around itself, with the associated phenomena of induction; neither is there any reason to exclude, in the present state of our knowledge of electrophysiology, that oscillating discharges, and therefore electromagnetic phenomena (waves) can be formed in the brain, and can radiate from it.

EXPERIMENTAL POSSIBILITIES

I am not ignoring the extreme difficulties, nor the serious objec-

tions which beset the possibility of electromagnetic waves of widely varying lengths which might evade the receiving apparatus, nor another possibility, this more probable than the first, that we are dealing with very weakened waves in any case, which weaken further in their passage across conductive nervous tissue.

But there were also advantages; the almost infinite repertory of reactions of living protoplasm (that nervous irritation is reactive protoplasm par excellence), the multiplicity and variety of biological forces provided by nature for the ends in view, and the fact that in trying to detect electromagnetic phenomena radiating from the human brain in given conditions directly, I had more propitious means at my disposal than those required for the indirect method, and I had at my disposal special human subjects in states of intense psychosensorial activity (oneirics, sensitive persons, psychoneurotics, hallucinatory psychopaths).

The sensitive medium who with such good will and with complete disinterest took a large part in my research, merits a particular mention. I am speaking of Irma Maggi of Milan, that sensitive person of singular power, endowed with pragmatic crypesthesia and clairvoyance, endowed with spontaneous and provoked (experimental) telepsychism even without object stimulus (or the stimulus of other persons).

The other subjects whom I tested repeatedly in my first experimental runs, possessed the following characteristics:

No. 1 – subject with motor epileptic symptomalogy;

No. 2 – subject affected with paranoid psychosis;

No. 3 – subject affected with paranoid psychosis;

No. 4 – subject with hysterical neurosis under light hypnosis;

No. 5 – subject with hysterical neurosis under light hypnosis;

No. 6 – subject with neurosis, with slight medium properties;

No. 7 – subject with hysterical physicopsychic symptomalogy with auto and hetero-hypnotic facility;

No. 8 – subject with acute lively hallucinatory symptomalogy;

No. 9 – subject with chronic, lively hallucinatory symptomalogy.

For the attempt at the direct inquiry, I had the idea of constructing and using an apparatus whose fulcrum and base were a thermionic tube: the triode.

It is now known that the thermionic tube, or audion or triode is the most delicate and sensitive instrument for revealing electromagnetic waves (and that it magnifies these waves for our senses); we owe this marvelous instrument to the ingenious invention and perfection of De Forest, who took it from the practical and ingenious application which Flemming thought up, based on the fundamental principle of Edison.

The thermionic tube is a precise experimental application, almost an experimental demonstration of the electron theory, the basis for the recent concepts concerning the ultimate constitution of matter.

THE SHIELDED CAGE

But the fact that we live in an electromagnetic environment, where radiowaves are in constant circulation, brought about the search for a means of isolation from these environmental conditions which was experimental conditions with the shielded metal cage which I shall describe a little further on.

I used the shielded cage to install apparatus which would thus be completely protected from any outside electromagnetic influence. With this cage, I proceeded to the experimental investigation of the aforementioned human subjects.

The first model of the shielded cage (or Faraday cage) was made of a wood framework in the shape of a parellepiped, whose sides were covered with galvanized iron plates, about 15/10 of a millimeter thick,

soldered together to insure complete airtightness. The cage was supported on a platform made of a fir table with attached bands under which the porcelain isolators were placed to insulate the apparatus from the platform. Three wires soldered to three points on the top of the cage on the outside, are twisted into one wire, whose end is connected through a switch to the water pipes; thus the shielded cage can be grounded if desired.

Access to the shielded cage is gained through a square aperture, about 75 centimeters on a side, situated on the top of the cage with a lid with a special closure like that of a cabinet; its purpose was to pass food through, of which I shall speak further a little later. The shielded cage has a wooden floor supported by iron plates on the bottom, and the walls and ceiling were covered with cloth. The outfitting of this cage consisted of a small bed, a small table and a chair.

There was a simple apparatus whose purpose was to supply the air required by the persons inside the shielded cage. It was made of a sort of table or wooden trestle upon which was combined a system of pulleys whose purpose was to activate a bellows by a small electric motor of 1/4 HP; a rubber tube was attached to this bellows which brought air to the shielded cage, passing through the sheet-iron cylinder which was full of small iron filings whose purpose was to serve as a filter.

On the anterior face of the cage, at about 20 centimeters from its floor were placed two other sheet-iron cylinders also filled with iron filings which were used to filter the air pumped into the cage.

When it was necessary to prolong a person's stay in the shielded cage beyond a certain time, he was supplied with the necessary food through intercommunicating boxes, one fastened to the outside and one fastened to the inside of the shielded cage.

These boxes were equipped with special rectangular lids whose

sheet-iron edges were about 10 centimeters high, which closed down into channels filled with iron filings placed on the edges of the boxes.

This arrangement allowed communication between the inside and the outside without disturbing the electromagnetic isolation.

But here we must note that for experiments which lasted only a few hours (from one to three or four hours) the quantity of air in the shielded cage was sufficient without pumping air from the outside, so that most of these experiments were performed without recourse to the aerating apparatus, and all were performed without use of the boxes.

The shielded cage was submitted to a check for airtightness by breaking a vial of strong perfume previously prepared in a lead tube, soldered to the shielded cage, and communicating with the inside. After 24 hours in the closed room there was not the slightest trace of perfume even when the cover of the shielded cage was raised and even though the vial remained there in the room for many days.

To test the electromagnetic isolation, we several times transmitted radiowaves from the outside of the shielded cage toward the inside, placing the induction coil in the best position for influencing the receiving apparatus. But though the apparatus outside the cage was influenced by the sound vibrations on the earphones, when the generators were on the outside and the recivers inside the shielded cage, we did not succeed in obtaining the slightest reception, although the instruments were in such close contact as to have only the thickness of the sheet-iron between them.

The first oscillator (O.I) employed at the beginning of this research is an apparatus for waves of length 300 to 4000 meters, using as aerial a square loop for the short waves, and an induction coil for the long waves. The apparatus employed 4 vacuum tubes; one an untuned high frequency amplifier stage, the second a detector, and the other

two in low frequency amplifier stages, which allowed quite some amplification. The crystal was also checked when shunted by a very weak capacitance.

A bit later I shall speak of the four arrangements given to apparatus O.II in the course of the experiments, and I shall also speak of the addition of a heterodyne.

Following along in my aim of looking for oscillations in the region of short waves, I proceeded to the construction – O.III – of a two-tubed amplifier for waves of 50-100 meters.

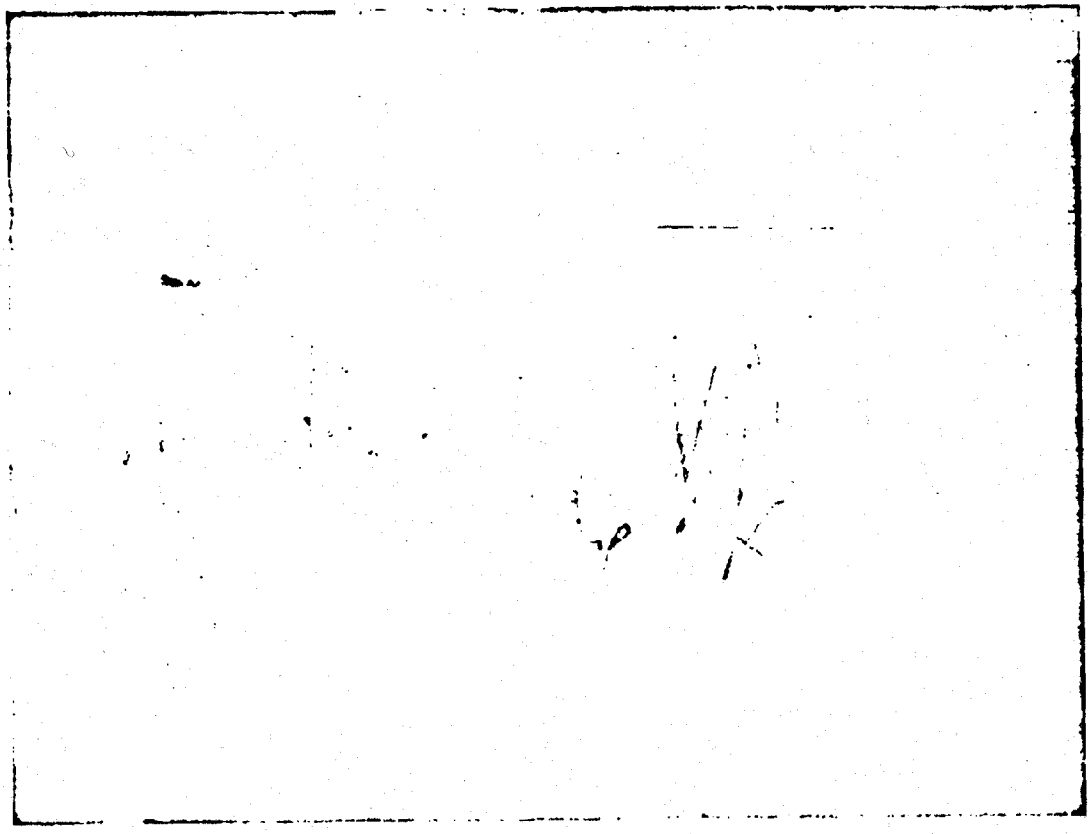

Fig. 1. The shielded cage as it looked in 1924 and the apparatus O.II.

It is unnecessary to say that such a range of waves, having a frequency of from 6 to 3 million periods per second unmodulated, were ab-

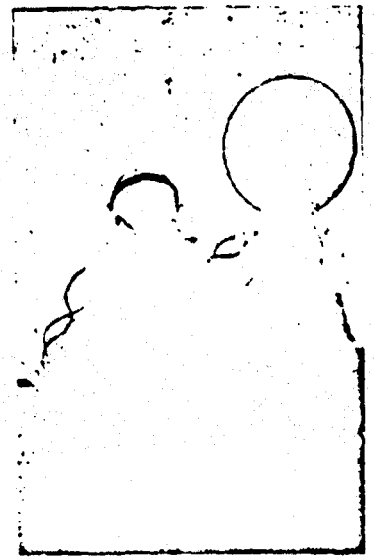

Fig. 2. O.IV autodyne apparatus.

solutely inaudible on the earphones.

Then I constructed a two-tubed heterodyne of almost the same wave length as the apparatus, intending to cause interference with the oscillations resulting from the transmitting-receiving that would later come from the subject under examination.

In the effort to detect ever shorter wave lengths, apparatus O.IV was constructed (Fig. 2) for waves of 1 to 10 meters in length with circular loop antenna of 30 centimeters diameter, modeled after the one studied by Mesny.

With the addition of a heterodyne for very short waves, we could, through the effect of interference, provoke audible beats produced by the difference in the two frequencies.

The earphones worn by the experimentor throughout the whole experiment were naturally joined to the apparatus.

The conditions rigorously observed in the experiments were the following:

a) repeated trials of the apparatus outside the shielded cage, paying special attention to the perfect function of the earphones and making sure that the regular static could be heard;

b) check of the function of the apparatus inside the shielded cage. This was always done for 10-15 minutes at a time and also for one hour and finally up to two hours, in order to know the reaction of the apparatus to the human subject in normal conditions of psychic quietude (the experimentor(s));

c) new control run when the subject to be examined was brought into the shielded cage with the experimentors, and the cage hermetically sealed;

d) the subject lies down on the bed, or sits in a chair, (the bed was later removed because the devices that were employed later

took up more space with their looped receiving antennas), the apparatus is turned on, the regular static in the earphones is verified, the experiment is begun and we remained outside the development of the phenomena and their external manifestations as if indifferent to their content, paying attention only to evaluate any changes of sound coming into the earphones;

e) at the cessation of the phenomenon, either spontaneous or decided upon in advance, I try to check the reporting of the apparatus and its function, both at the moment of cessation and in succeeding moments;

f) before making a new run, without changing anything in the arrangement of the apparatus, I check it with the same subject distracted, and in his habitual psychic condition;

g) systematic notes are taken on the development of all single experimental runs; the particulars of the arrangement and function of the apparatus, the time and the sounds heard on the earphones are recorded;

As is seen from the description of the apparatus O.I., I thought it fitting to begin my research with a common apparatus for detecting long radio-telephonic waves (λ = 200 to 4000 meters) reserving until later the employment of instruments made expressly for my purposes and sensitive to ever shorter wavelengths.

The fundamental fact that the triode is sensitive to electromagnetic oscillations — radiowaves — varying in length from one meter to 30,000 meters, must be borne in mind.

With such a wide range of possibilities and especially in the very short wavelengths, one comes directly upon the problem of audibility. If we take radiowaves of wavelengths from 1 to 10 meters, the frequency will vary from 300 million to 30 million cycles per second, in the inaud-

ible range. To render them audible, we must use the familiar interference principle by adding a heterodyne to oscillate (in our particular case) at 299 or 29 Mc, so that combinations with 300 or 30 Mc will be audible by virtue of the beats at one thousand cycles. This applies, of course, to steady waves.

For damped waves, we will recall that they are transmitted in groups of oscillations, and that the frequency of these groups is between 600 and 1000 periods per second and therefore audible (this audible frequency of grouped waves must not be confused with the much higher and inaudible frequency of the same unmodulated waves).

The beats in the case of persistent waves or grouped waves can be rectified by the vacuum-tube thermionic detector or by a crystal detector; with these methods, the high frequency current is transformed into pulsating low-frequency current capable of causing the membrane of the telephonic receiver to vibrate. I say this because apparatus O.II is equipped with a crystal detector; one need not mention that the vacuum tube detector is without doubt better suited to rectification because with its well known inconveniences go the advantages of optimum and simple reception.

I shall mention finally that as we shall see, there is an apparent fundamental psychophysiological unity underlying the phenomenology (either spontaneous or provoked) shown by the subjects under experimentation, though the aspects of this phenomenology will be differentially accepted.

The sensitive medium Miss Maggi presented phenomena of pragmatic cryptesthesia or experimental telepsychism, using handwriting and objects as a stimulus, and reacting with automatic writing as was habitual with her. But Maggi presents a still more vivid cryptesthetic phenomenology, or better still telepsychic phenomenology — without stimulus by objects under light hypnosis provokable for brief moments by the procedure of fascination: under these conditions, Maggi acquires re-

markable lucidity with hallucinatory visions which prove to be true to quite some extent.

The subjects Nos. 1, 2, 3, 8, 9 (epileptic with sensitive, auto-provokable aura, paranoid and hallucinatory) were left as they were; they were questioned at certain times about their sensations, or about their ideo-affective activity and its psychosensory contingents.

Subjects Nos. 4 and 5 (hysterics) were placed under light hypnosis; in this state, hallucinatory visions can be easily provoked by the recall of places and persons known to them, under special conditions of lively emo-affectivity.

Subject No. 6 was tested in his usual condition of typical seizure.

Subject No. 7 (psychohysteria) was placed for the inquiry either in autocthonous dream conditions (mnemonic reviviscence expressed in acute psychosensorial hyper-activity) or under hypnosis induced by fascination and with hypnotic pall. Under these latter conditions, the hallucinatory visions acquire extreme intensity with participation of the visual and acoustical psychosensory region.

I should now like to summarize the results of these many experiments which were performed between the end of 1924 and the end of 1925.

It must be noted that in the interpretations of noises reaching the earphones, the danger of error is due to noises coming from the storage cells or anodic batteries.

But all doubt or possibility of error is eliminated when the static caused by the storage cells and batteries is interrupted by quite different sounds. Finally, I need not mention the repeated checks made on the function of the apparatus, and the regularity of the static; also the shielded cage protects the apparatus from extraneous electromagnetic oscillations produced on the inside of the cage.

EXPERIMENTS WITH APPARATUS I (O.I)

This is ordinary radiotelephony apparatus for wavelengths of 300 to 400 meters. The ground is joined to the walls of the shielded cage and a wire connected to the apparatus, woven through the whole length of the top of the cage, or a square loop, functions as an antenna. In the various experiments performed with the sensitive medium, during the remarkable phenomena of pragmatic cryptesthesia, no change in the static was heard, due to electronic bombardment of the triode; during the states of spontaneous hallucinatory trance, much louder static noises were heard which could not be clearly distinguished from the varied acoustical reactions on the earphones, due to the storage cells and batteries.

Subject No. 4 was tested on Apparatus I under these conditions with no results.

We passed from these orientative pre-experiments to experiments using the second apparatus which had been made ready in the meantime.

EXPERIMENTS WITH APPARATUS II (O.II)

Apparatus II is a crystal receiver connected to a low frequency amplifier with three stages.

The crystal (galena or pyrite) which does not receive persistent waves, has the property of rectifying radiowaves and of making them heard as successive trains. The O.II receives short length trains of radiowaves also, but they are always of audible frequency, and one can calculate that the wavelength to which it is sensitive goes from 100 meters down to about 20 meters.

I used O.II for a long time and for very many experiments. As always control runs were made when the storage cells and batteries were renewed. The apparatus was arranged in four different ways:

a) Direct reception: crystal-ground-antenna;

b) Idem but with the crystal shunted by a very small capacity;

c) Idem but with the earphones shunted by a very small capacity;

d) Crystal reception with 4-loop receiving antenna;

I shall pass over the results obtained with the first three arrangements because the grounding of the shielded cage caused irregular static and prohibited any exact evaluation of the sound reactions. Only the third arrangement (c) – antenna, circuit, crystal, ground – gave regular static and produced a few sensitive responses, though they too were not always decisively valid, judging from the inducement of the sensitive aura in subject No. 1 or a distinctly passionate moment (mnemonic emotive-sensory evocation) in subject No. 2, or in suggestive-hallucinatory conditions of subject No. 7.

We ran numerous and repeated tests with the fourth arrangement (d) of O.II. – crystal reception with 4 loop antenna – employing subject No. 7, the sensitive medium.

From then on, experience having shown the square loop receiving antenna to be more useful than the wire antenna, the instruments in the shielded cage remaining thus free, we kept the cage henceforth systematically insulated from the ground.

The looped receiving antenna of the apparatus was turned toward subject No. 7, who, just seated, spontaneously turned her face toward the angle of the angenna and then entered into autohypnosis. Noises similar to radiotelegraphic signals were then heard which when stopped, alarmed the subject, and when rebegun, brought the subject back into hypnosis.

If one induces hallucinatory visions with the hypnotic pall, the telegraphic type of noise begins to get stronger again; the particular sonority of the noise changes relative to the intensification

of the suggestive visions. Here for the first time, we can hear noises and sounds which are quite different from the noise of the batteries and storage cells. When subject No. 7 has spontaneously acoustical hallucinations in the hypnotic state, these sounds increase continuously in volume; they tone down and then cease as the subject awakens.

I must mention that subject No. 7 is capable of the phenomenon of pure transmission of thought, really and truly without contact. That is to say while the subject pursues a hallucinatory (hypnotic) state, those typical telegraph-type sounds are systematically repeated. In succeeding experiments, still using apparatus II with the looped antenna, the correlation of the phenomenology presented by subject No. 7 in the state of light hypnosis, with the sounds of the apparatus became more and more evident; these sounds were loud noises as of rushing water which then ceased leaving only the regular static which startled the subject; these sounds resume as the subject lapses into a new hynotic phase.

With the intensification of the sensorial phenomenology of the subject (hallucinatory visions with profound emo-affectivity) besides the hisses as of rushing water, a type of clicking, whistling and modulated notes like those of an untuned violin came over the earphones. Under these conditions, the reactions were repeated precise, positive and protracted.

When subject No. 7 entered into spontaneous or provoked hypnosis with visions or hallucinatory auditions, the regular static gave way unfailingly to the aforementioned sounds on the earphones. These sounds (varied noises of gushing, hissing, whistling, prolonged modulated notes) ceased abruptly with the cessation of the subject's hypno-hallucinatory state, whether this cessation was spontaneous or provoked, and were resumed when a new hypnotic phase began. Finally, the sounds

increased in intensity with the increase of hypnotic, emotive visions and auditions of the subject.

These results were so often duplicated, not only with subject No. 7, the sensitive medium, but also with others, that the only valid conclusion one can draw for such cases is that electromagnetic phenomena, produced in the shielded cage are directly dependent upon the particular psychic conditions of the subjects, and therefore evidently emanate from the cortical nerve centers of the experimental subjects.

I experimented at length, using primarily the sensitive medium with apparatus O.II equipped with a heterodyne (the static is just as regular) in its different arrangements.

I had better positive reactions on the earphones in states of lucidity and hallucinatory visions than during pragmatic crypesthesia.

EXPERIMENTS WITH APPARATUS III AND IV (O.III and O.IV)

I tested the sensitive medium and three other subjects with O.III (two-tube amplifer and two-tube heterodyne).

Some discriminatory tests of the apparatus were negative when the heterodyne was not used.

Using the heterodyne during Maggi's telepsychy (visions of far off places with particulars of the environment, description of objects, etc.) one heard frequent scratching noises on the earphones.

One can calculate that O.IV receives radiowaves of 1-10 meters length, or to be more cautious from 4 to 10 meters; it is supplied with a circular loop antenna of 30 centimeters in diameter, of a design similar to the one studied by Mesny.

I noticed with O.IV when testing subject No. 8 in hallucinatory state, frequent interruptions of the regular static on the earphones by knocking noises absolutely extraneous to the apparatus, and completely different from any battery or storage cell noise.

Tests using subject No. 9, hallucinatory, age twenty, also gave similar positive results.

When I used apparatus O.IV with the sensitive medium during pragmatic cryptesthesia, there were intervals of very particular noises. During a hallucinatory vision, hypnotic and rather lively, with active psychosensorial acoustical interest, there were continuous noises on the earphones, then very short, rapid sounds like those of telegraphy.

The cessation of these sounds on the earphones interrupted Maggi's hallucinatory, hypnotic state and resumed with each new hypno-hallucinatory phase.

I also noticed the following interesting sound reaction on the earphones. When Maggi came out of a rather prolonged hypnotic-hallucinatory state (the return to herself came gradually) the passage from the state of trance to that of awakeness was signaled by characteristic noises on the earphones. In succeeding experiments performed only a few days apart, I noticed that the sensitive medium refined her telepsychic gifts when repeating the state of hypnotic trance, and that the reactions on the earphones became correspondingly more marked with gushes and frequent rustlings, whose intensity was relative to the intensity of Maggi's telepsychic vision.

These varied noises and sounds which are always heard above the static at frequent though not always regular intervals, diminished in intensity and finally disappeared as the telepsychic vision was extinguished, leaving only the regular static.

I must not forget to mention that a thorough check of the function of O.IV showed it to be beyond doubt the most sensitive of all, so I tried to stimulate its composite activity in a normal subject of high intelligence.

There was a slight positive reaction during intense psychosensor-

ial activity of the brain, even in normal subjects using apparatus O.IV.

Finally, in some tests run on subjects in a state of marked mental debility, the apparatus gave no more than a weak sign of sensitivity.

We can reduce the psychic phenomenology of the subjects placed under experimentation to some fundamental notes. When the sensitive subject exhibits phenomena of pragmatic cryptesthesia, we are faced with cognitive psycho-sensorial processes with perception from a distance outside normal conscious life. The organic substratum of the phenomenology of the sensitive medium (aside from its essence and modes) lies thus in the cerebral cortex, and particularly in the sensory regions.

Subjects No. 5 and 7 exhibit hallucinatory phenomenology, both in auto and in hetero-hypnosis (No. 7 also presents the phenomenon of lucidity) whether spontaneous or provoked, which we can attribute to psycho-sensory cortical activity. Subjects 8 and 9 present a phenomenology which we may describe as genuinely hallucinatory (morbid).

During one very exceptional telepsychic vision (visions of the Italian parliamentary session with description of a most particular event which the subject could not possibly have foreseen in her normal life, and which was afterwards confirmed, comparing such aspects as the time with the newspaper accounts of the following day) the noises became very intense during the whole telepsychic vision, and stopped abruptly when the vision ceased.

In another experiment, when Maggi, after having quite lively visions, was left in peace and fell into a tranquil sleep, the static built up and remained extremely regular. In tests with O.IV, there were also quite interesting positive results: clicking noises interrupted the static at regular intervals.

From this synthesis which I have given, which is the experimental result of one year's research, it stands out clearly that electromag-

netic phenomena radiate from the human subject under certain psychic conditions, and that these radiations do indeed come from the brain.

This is the first time, as far as I am concerned, outside the collection of rather vague hypotheses and imprecise, indirect deductions, that such a direct statement can be made on experimental grounds.

EXPERIMENTS WITH APPARATUS V (O.V.)

O.V. is only O.IV. equipped with a heterodyne (Fig. 3).

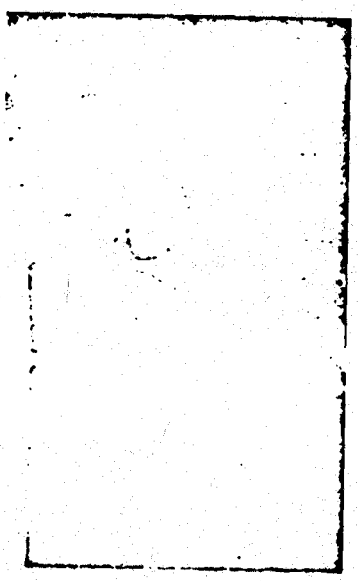

Fig. 3. O.V. equipped with a heterodyne.

We equipped O.IV with a heterodyne because the electromagnetic phenomena radiating from the brain lie within a frequency of 300 to 30 million periods per second and are therefore inaudible.

The positive reactions which the apparatus gave without a heterodyne mean, as I mentioned previously, that cerebral electromagnetic phenomena were emitted in that case in groups of at least a thousand periods per second and were therefore of audible frequency.

I should add that from the beginning I had thought about the necessity for a mechanical instrument which would record these phenomena,

and which would complete the subjective system of the earphones. But in truth, I reserved the solution of this technical detail for a time when I should have the security of some positive results. Today, I can say that this recording instrument is in preparation, and that with it we can have graphs which will distinguish the sound-vibrations characteristic of cerebroradiant, electromagnetic phenomena, from the static heard on the receiving apparatus. But I wish to add that the acoustic means of registration will not be abandoned, the mechanical means will be added to it, because I believe that the acoustical means, because of its discriminative finesse, will still produce the best results for this kind of research and more so as we approach the identification of these cerebral phenomena.

The human material which I shall have at my disposal for experimentation consists of normal subjects exhibiting vivid psychosensorial activity, hypnotizeable sensitive persons, psycho-hysterics and hallucinators. From the systematic sampling of numerous and conspicuous phenomena of subjective metapsychism and from samples of psychopathological pertinence, I hope that the characteristics and properties of cerebral radiations will become decisively clear. Only after that can we embark upon the theme of the normal activity of the brain with any hope of success.

The existence of electromagnetic phenomena radiating from the human brain under given conditions, poses many problems to which we must return when we are more informed on the nature and characteristics of these electromagnetic oscillations.

It is certain that light has been shed upon many obscure psychic phenomena – psychophysiological, metapsychic and psychopathologic – to which we must return as current research develops and becomes more precise. Let it suffice for the moment to catalogue the themes which

must of necessity be looked into again:

a) dreams, hypnotism, transmission of thought, phenomena of sympathy and antipathy, etc., and the concept of subconscious life;

b) all the phenomena of metapsychics called subjective (cryptesthesia or experimental and accidental telepsychism);

c) the pathology of the sensory sphere, particularly relative to hallucinations, and the physiopathology of memory which is the fundamental basis of the ego, of consciousness (including the subconscious). Agonic cinematographic memory, particular memory of states of hysterical hypnotic trance (with split personality and its alternate manifestations) hypermnesia, which reproduces memories more or less in hallucinatory form; these are some of the phenomena which we can explain by reducing them to a common physiopathological, psychosensorial denominator.

The theory of representative centers, and the theory of the psychological reflex, which writers wished at one time to substitute for the physiological theory of the excitation of the sensory centers, have been able to answer mild criticism but not the principal one that they do not furnish a solid, explicative interpretation for the hallucinatory phenomenon.

The sensory centers of the brain are not hypotheses like the representative centers, but by this time, they are an indisputable reality. This research on cell structure, which has consolidated the presence of numerous polymorphous cells in the bottom layer, and of tiny cells in the granular layer within the sensory zone, and their important connections with the other layers, is now tending to return to that zone, that dignity of function which seemed to have been lost with the prevalence of Munk's theory and Flechsig's findings. Roncoroni observed that the significance for mnemonic representation of the polymorphous

layer was in keeping with the elaboration of this layer in the essentially sensory area, where the transformation of sensorial processes into mnemonic processes is conspicuous. Marinesco succeeded in demonstrating that the zones of sense reception are located near other zones of a particular structure to which we can legitimately assign the functions of elaboration and synthesis of sense impressions. Roncoroni means that the other afferent layers (essentially the granular internal layer) do not function "isolated from their representatives, but with the same energy, as if synchronized and integrated, because all the layers of the cortex participate in the formation of psychic phenomena, except in abnormal states (dreams, hallucinations) where there could be a dissociation of the two phases of the process and the stimuli, whether projective or associative; process and stimulus being no longer functionally integrated to the representative zones, sensory facts and not mnemonic representations would be induced."

The emissions of radiations by the human brain in hallucinatory activity completely upsets the definition, common until now, that hallucination is perception without object, or without a corresponding and actual stimulus. True hallucination (not the neighboring phenomenon of illusion + delirious interpretation) begins to appear not as a subjective, but as an objective reality, since physical radiations are involved.

CEREBRAL RADIATIONS AND THEIR OPPOSING PRACTICAL AND THEORETICAL CRITICISMS

A noticeable movement of critical discussion, particularly in France, America and Germany followed by first experimental report published in August, 1925 in "Neurologia" and in the "Revue Metapsychique"; Azam, Brenot, Bourgeois, Sudre, Gaillard, Birot, Free, Tischner, Driesch, Glogan, Klinckowstroem and Herbertz were part of this move-

ment.

The present reply to the detailed objections and to the general observations came a year after the criticisms, because out of respect for the thoughtfulness of the criticisms and the renown of their authors, I felt obligued to make my rebuttal not only with words, but with new facts resulting from new experiments performed with those technical objections in mind, which these critics had called to my attention.

While my first paper was being published, we continued experimenting with the already described apparatus O.IV of the Mesny type, and out of three subjects (one hysteric and two neuropsychasthenics) I obtained positive results in two cases and negative results in the third case; these three subjects were tested in hallucinatory, auto or heterohypnotic oneiric states.

It had been suggested that I equip apparatus O.IV with a heterodyne to try to detect very short waves. But the addition of the heterodyne, (apparatus V) rather than improving the experimental conditions, gave me dubious results, because of the apparently endogenous static which came so violently over the earphones, so that I was led to give up the heterodyne completely, after various tests, both with and without subjects; I did this only after I had made sure of having removed the batteries and storage batteries from apparatus O.V., placing them outside the shielded cage and putting lead-shielded wires inside it.

Afterwards, I also eliminated the storage batteries and substituted several batteries in their stead; I also reduced the vacuum tubes to two nonluminous Mikron-type tubes. This system improved the regularity and invariable constancy of the static, interrupted now and then only by some readily identifiable noise.

Experiments with a hysterical subject, auto and hetero-hallucina-

tory, and with a subject afflicted with a violent acute hallucinatory syndrome, gave positive results, comparable to those obtained in previous experiments already described in this report.

In the meantime, we had apparatus O.VI constructed in our search for the best apparatus, that is the one which would be most dependable; O.VI was symmetrically mounted, modeled on the Eccles-Mesny apparatus, which lent itself rather well to the study of waves of 10 meters' length.

The system was composed of two high frequency vacuum tubes, mounted opposite each other, the grids and plates joined together by means of a coupling inductance composed of two small square-looped antennae, which served to detect the eventual oscillations. Thus we eliminated all the metallic parts possible, and the capacitors and conductors were reduced to a minimum without insulators, for the purpose of registering the least capacitance.

The center of the grid inductance was connected to the filament power supply and the center of the plate inductance was connected to the high voltage battery.

The two high frequency tubes were followed by two other low frequency vacuum tubes, thus obtaining some amplification of the oscillations. (I must mention that it was suggested that I try to record and transcribe the oscillations detected). The inductances consisted of two small ordinary square-loop antennae, 20 centimeters on a side.

If the heater power in the tubes varied, internal high frequency oscillations were induced in the system which interfered with the oscillations of usual frequency, giving rise to beats of such an intensity as to make recording impossible.

All these instruments were inside the shielded cage while the power supply, that is, the collection of batteries and the plate battery,

were left outside. We added filters to these batteries (impedance and capacity) to assure the most constant current possible, free from variations which could come either from the batteries or from the storage batteries.

With this system, the headphones were calm and quiet. Only when some one moved abruptly or beat his feet on the floor could rapid, crackling noises be heard on the earphones; but they ceased when the cause ceased, and could not be confused with the signal noises received during definite experiments.

In the meantime, I had a very sensitive galvanometer prepared, equipped with a thermoionic vacuum tube joined to the receiving apparatus to substitute the auditory signals of the earphones with the deviations of a pointer on a measuring scale.

After this, this apparatus having given good results, we proceeded, with some useful modifications, to mount the apparatus for photographic registration.

When the check on the earphones assured us of the persistent regularity of the static, we attached the receiver to the galvanometer.

I must mention here that the galvanometer needle deviated at the mere presence of two, three or four persons in the shielded cage; even their conversation produced a certain agitation.

A slight and rapid displacement of short duration was noticeable if one approached the square-loop antenna, and the change in capacity produced clicking noises on the earphones.

I did many experiments with Miss Maggi, the sensitive medium, which gave positive results.

It was only during the telepsychic phenomena (cryptesthesia and truthful hallucinations) and only then in certain determined moments, that clear unequivocal deviations with the following characteristics

were noticed on the galvanometer:

1) During phenomena of pragmatic cryptesthesia, while Maggi, pale, concentrated, in a state of slight trance, touched the object-stimulus, a progressive deviation was noted on the galvanometric needle until it reached a maximum point. When later Maggi wrote or spoke about the object, the needle remained inert;

2) Whereas during the cryptesthesia, when hallucinatory visions of persons or objects arose, the needle oscillated constantly;

3) During the telepsychic phenomena, whether spontaneous or provoked (visual and auditory hallucinations from Mazzini to Staglieno, from D'Annunzio to Gardone, etc. ...) the needle oscillated noticeably. During a state of slight trance, an interesting spontaneous, telepsychic phenomenon was produced. I was in the shielded cage with Maggi and Mr. Rosa. I was the only one who knew that during the course of the evening a lady would be coming to see me. It was impossible to hear the noise of someone entering my apartment from the shielded cage, since my apartment was on another floor. Yet, at a certain moment, Maggi said that she "felt" that a lady had come into my apartment, and then she gave such an exact description of this lady that Mr. Rosa and I were dumbfounded.

Here we see partially repeated, the telepsychic phenomenon of the Italian parliamentary session, of which I spoke in my first paper.

Let me mention that, referring to the description of this aforementioned phenomenon, some critics have held that it is in contradiction with the results of the experiment. It has been said that Maggi's truthful hallucinations did not coincide with the sounds coming over the earphones, since in the vision of such a far away event, one is dealing with waves which can freely permeate the shielded cage and whose length is less than one hundred thousandth of a millimeter;

these waves could not influence a radio receiver made for waves of 10 to 20 meters' length. And one can deduce that the brains of the other subjects had radiated similar oscillations of a wave-length less than one hundred thousandth of a millimeter, and that they could therefore not be detected on the apparatus as it was described. During this experiment, I myself noticed the strangeness of this phenomenon, and I also wondered about the possibility that radiations could cross the shielded cage and might therefore be radiations of a higher frequency, so that the receiving apparatus with its thermionic tubes for waves of 10 to 20 meters was not sensitive to them. But I obtained a positive result that I could not neglect, even though I could not proffer a definitive explanation, and even though it put into question the validity of the experimental conditions. I limited myself therefore to the description of the experiment from a psychic point of view, and to the experimental results, stating with due exactitude that during Maggi's visions, the described signals were indeed heard over the earphones. For whoever overlooks this superficial criticism, it will still hold that during the telepsychic phenomenon in question, Maggi's brain could have emitted radiations of a certain wave-length in unverifiable amounts, among which we should be able to find electromagnetic radiations of wavelengths close to 10 meters, since apparatus IV transmitted such signals. Neither more nor less. But there is another hypothesis, also quite probable, which is that we are dealing with a telepsychic phenomenon coming from Miss Maggi's subconscious before she entered the shielded cage and which came into her conscious level during the state of slight trance. The phenomenon could also have been strengthening before Maggi's entrance into the shielded cage, in the subconscious of an assistant, from where Maggi could have appraised herself of it by means of diapsychism by proximity.

These considerations can also be extended to the second case mentioned above. As we can see, the wish to base the telepsychic phenomenon in question on the apparatus, and thereby depreciate its reactions, would be childish pretense. With apparatus VI, I obtained upon one subject a whole series of extremely interesting results, upon which I should like to say a few words.

This is the case of Mrs. M..., whos presented symptoms of prolonged melancholy depression after the death of her young son, accompanied by quite clear auditory and visual psychosensory phenomena regarding her lost son. In full daylight, she saw him suddenly appear before her, as though he were alive and speaking to her, in his habitual manner; in the evening, during the half-wakeful moments that precede deep sleep, he appeared to her as he was during his brief illness; sometimes she saw him on his own pillow when she got up in the morning. At the cemetery, where she went daily, the dead boy smiled at her, she heard his voice which came from underground, call "mamma," and she felt such a palpitation that she was riveted to the spot, anxious and desolate. These hallucinatory phenomena continued for more than a year just as intensely without causing the least mental debilitation. It was enough for Mrs. M... to close her eyes and compose herself for a moment, in order to see her son before her, seeming so alive that she felt almost able to touch him. Here is the series of experiments performed with this subject.

Apparatus O.VI is in good working order, accurately checked before and after the experiments.

The subject, calm, is partly reclined on a divan, and I am seated near her. After having started and regulated the apparatus, both I and the subject avoid any inopportune movement; then the hiss on the earphones becomes very regular.

When she drew her hand to about 30 cm from the square-loop antenna, I noticed the characteristic reinforcement of the hiss; and as she drew her hand closer, the hiss reached a maximum in the form of its characteristic ffft noise, due to the change in capacity of the apparatus; the hiss stopped and resumed as the subject approached or withdrew her hand.

It is noteworthy that when the subject and I were speaking together, either normally, or when the subject was agitated, the hiss on the earphones was not disturbed, but remained invariably regular.

First experiment - the subject enters into a state of self-composure which could be called light auto-hypnosis, and sees her dead son. At the same time we see the hiss on the earphones grow stronger, then noises which mask and then substitute themselves for the hiss (noises quite different from those induced by brusque movements) and continuous characteristic signals similar to telegraphic signals: tic, tic, tic... clear, marked and quite distinct, which could never be confused with other noises.

It must be noted that these characteristic signals were never heard in the course of the numerous experiments made with O.VI. even when three or four persons were inside the shielded cage moving about. The characteristic clicking noises could be heard in the distance, but they were quite different from the tic which gives a strong, intense acoustical sensation like that of the flange spring vibrating on the

earphones.

One must observe that during the vision, M. did not show any appreciable external signs of emotion. The subject awakens and the regular hiss returns on the earphones which continues during the whole time that we speak at length of different topics relative to her dead son.

Second experiment – Light provoked hypnosis. I suggest a vision of her father (living) of a woman friend (also living) and the noises and the characteristic tic are repeated in perfect correlation to the psychosensory phenomena; the subject awakens, and the regular hiss returns.

Third experiment – Brief fascination and rapid hypnosis. I suggest the vision of her father's house and of her mother (dead) in the time that the lady, still a young girl, lived with them.

The subject sees herself as a young girl, sitting in the salon, embroidering, and sees her mother occupied with the kitchen chores.

In evident correlation to the moments of greatest hallucinatory intensity (I ask the subject from time to time what she is seeing and what its characteristics are) the hiss is substituted by noises and by the tic. I suggest that the subject open the door to let another person in and I think intensely about her son.

The subject sees her son going up to embrace his grandmother. Intense noises and a series of tics come over the earphones which are repeated at different times for several minutes. All of a sudden, the subject bursts into tears. The vision of her mother and her son has disappeared. The state of emotive overexcitation is intense.

It should be noted that at the outburst of the intense emotive reaction, the hiss on the earphones became regular again, and remained

so during the whole crying spell, during her return to complete wakefulness, up through the moment when the subject regained complete calmness which took about 10-15 minutes.

Fourth experiment - Brief fascination. Very light hypnosis. I suggest the vision of a person antipathetic to the subject. Very pale vision, soon dissipated; regular hiss on the earphones.

Fifth experiment - Intense fascination and rapid hypnosis. When it is deep enough, I invoke all at once the vision of her dead loved ones: mother, brother, son. In perfect correlation come well separated noises over the earphones, taking the place of the hiss, and at very short intervals, a clear series of tics. The galvanometer is now joined to the receiving apparatus. The needle shows marked deviations which are successively repeated. Each series of deviations lasts about 5 to 10 minutes, and between one series and another, lasting a few seconds, there are slight deviations or slow impulses revolving either to right or left.

Once the subject is awakened, the hiss returns and remains regular, and the galvanometric needle also returns to its fixed position. At this state of our experimental activity, we see first of all that accurate measurements demonstrate that apparatus O.IV., O.V., O.VI receive waves slightly longer and slightly shorter than 10 meters, and secondly the possibility arises that the signalization be sufficient for transcription. I decided then to prepare a receiving apparatus O.VII for a new experimental phase, apparatus which would be able to receive and to transmit electromagnetic oscillations of 3.2 and 1 meter wavelengths in a dependable, precise and controlled manner, and even wavelengths of less than one meter; this apparatus would be connected to a recording device.

CRITICAL OBSERVATIONS

And now let us turn to the critical observations.

The reply to the first group of objections concerning the possibility of error relative to the quality of the instruments employed, is given for the most part in the experiments described, which, since they were done before the Congressional Report, were also done before the publication of the reply to the critical observations.

Some critics hold (M. Henry Azam – "Revue Metapsychique" No. 5, 1925) that the noises coming over the earphones can be attributed to the fact that the walls of the Faraday cage – he is referring to my shielded cage – are capable of reflecting very short waves, causing an atomsphere hypersaturated with electromagnetic vibrations, which are not in stable equilibrium, but vary continuously at the least material disturbance, and this is why, as M. Paul Brenot, noted director of the "Compagnia Generale di T.S.F."[General Wireless Telephone (Radio) Company] writes, "a very sensitive receiver can generate these same oscillations of variable frequencies, the causes of which generation are multiple and complicated; oscillations that can cause a hiss, a hum, etc., and which can arise either because of the movement of an operator, or because of the displacement of a wire, or to the internal vibrations of a battery, of a storage battery or of a tube."

"Besides this, observes Brenot (Revue Metapsychique No. 5, 1925) if the observed cerebral radiations were modulated short wavelengths, one should find very precise tuning of the shortwave receiver for very short wavelengths, many delicate precautions are necessary; I adhered strictly and rigorously to these requirements not only in the experiments dealt with in my first report but also in my succeeding experiments.

Taking up my experiments once again, and preparing new receiving

apparatus each one more delicate and precise than the last, I forced myself to reduce this possibility of disturbance to a minimum - and consequently to reduce the extraneous noises in the earphones - which depend upon the functioning of the batteries, was done with the maximum care. The alignment of instruments which had to function together was made with the greatest accuracy, before and after the experiments and sometimes between different experiments.

Naturally, once the experiment had begun, both the operator and the subject remained absolutely immobile and refrained from touching the apparatus.

For example, I never regulated the receiving apparatus while an experiment was in progress, otherwise the disturbances which Brenot mentioned as possible objections, would be numerous and disconcerting.

In sum, the possibilities of outside disturbance were constantly being eliminated, while I was always mindful of the possibilities of inside disturbance, checking the apparatus closely, and taking the greatest precautions.

I must now explain one experimental detail quite clearly. While movements and conversations between the operator and the subject do not provoke appreciable disturbances in the apparatus while experimentor and subject are completely calm, when particular psychic or telepsychic (oneiric) phenomena are manifest, apparatus O.VI signals the reception of electromagnetic oscillations unequivocally.

In view of the experimental conditions explained above, critics of the apparatus must take these new proofs, founded on facts, into account, since all of their demands have been satisfied.

Some critics have insisted upon the atmosphere, supersaturated with electromagnetic oscillations, and upon its influence on the apparatus situated inside the shielded cage which they assume, and therefore

declare to be disturbing.

Now, since we are dealing with an experimental detail, I must carry the question out of the realm of theoretical discussion and into the realm of practical experiment.

In reality, my numerous experiments permit me to state that I have been alone, or with a subject, or with three or four persons in the shielded cage when all the instruments were turned on for many hours and many different times, and never was there any phenomenon of reception to be noticed, nor any particular sensitivity of the receiver. That is, taking care to take all the experimental precautions with scrupulous exactitude.

But if Azam's observations are similar to Brenot's along one line, they go beyond Brenot's along another line. I refer to the influence of the atmosphere of normal air on the function of instruments inside a metallic cage. His criticism extended also to the possibility of the ionization of the atmosphere within the shielded cage, under the influence of radiations of higher frequency than Azam thought the human body capable of emitting; this situation would of course hinder the normal function of the receiving apparatus.

This means that the supposed radioactive phenomena, which cause the discharge of the charged particles in the cage, — we know that all electric discharges, whether perceptible or not, are accompanied by the production of hertzian waves, more or less attenuated — would influence the apparatus in this indirect way; the apparatus then, in the last analysis, would have signaled exactly the wave propagated by this discharge, by audible reactions on the earphones such as "a whole series of noises and hisses either modulated or strident." But Azam ends up by confirming — aside from this hypothesis, which I shall discuss presently — the fact that the very-short wave apparatus acquires an ex-

treme sensitivity inside the shielded cage, which is all to the advantage of the system.

Now I must not hesitate to say that Azam's observations concerning this hypothetical mechanism, discussed analogously, would have some substance if the noises in question, heard on the earphones during the telepsychic phenomena, were precisely the noises – and no other – of the so-called ionization action, that is, if these noises depended upon the discharges and the reactions of the circuits to one another, and if they were definitely coming from the apparatus.

But this is not the case. When the instruments are influenced by radio waves coming undisputably from the outside, that is from other transmitters, or from electrical discharges, they produce noises on the earphones such as have been described above.

One must also bear in mind that the apparatus was considerably perfected, conforming to some interesting critical observations; with apparatus O VI (and even more so with apparatus O.VII) numerous varieties of noises perceptible on the earphones were reduced to well defined, identifiable acoustic signals, quite different from the noises produced within the apparatus which could disturb its functioning, as Azam had pointed out.

In other words, the new series of experiments which I did during that year free us from the doubt expressed by Azam concerning the so-called human radioactive emanations, and their influence on my apparatus. I do not mean to exclude by saying this that radiations of this type can come from the human brain along with the others.

* * *

To assume that the radiation of the brain has very high frequency, and thus infinitely shortwaved (less than one millionth of a millimeter) [illegible] induction which not only the technology of the wireless

telephone (radio) but also biological theory have disproven.

In the manner of Brenot and Azam, Mr. Andry-Bourgeois (Revue Metapsychique No. 5, 1925) of the Ecole Superieure d'Electricite states that "according to the phenomena of telepathy, which know neither distance nor obstacles, cerebral (thought) waves must have a frequency higher than x-rays or the "gamma" rays of radium C, i.e., of the order of quintillions per second, and wavelengths shorter than one millionth of a millimeter."

This deductive process starts with a statement – the still unknown mechanism of telepathy – which is absolutely arbitrary, and which seems unacceptable to me. Another observation of Andry-Bourgeois is that the radiations which I had described were "simply human radiations in all sorts of wavelengths, which are emitted by our bodies"; but they are, on the contrary, certainly worthy of discussion.

On this subject, I must mention to the critics, that in my first paper I enunciated the general thesis that cerebral radiations could constitute one part "of a series of electromagnetic oscillations of various types, radiating from the brain under certain conditions, and related to the effects produced by these conditions."

But if, during specific psychic or metapsychic phenomena, it is probable that the human brain does emit radiations of varied wavelengths, the signals which my instruments send out do permit us to assert that oscillations which are radiated are detected by a receiver at 10 meters' wavelength for example; this does not exclude the possibility of the emission of other waves which the apparatus is incapable of receiving.

Eminent radio specialists asked me to present schematically some biological data, simply to demonstrate that while the acceptance of the hypothesis of cerebral, radioactive emissions is not contingent upon the recognition of radioactivity either in nerves or in any other organ of the human body (I know of no definitive work on this subject to date) it is clear by this time that the reaction mechanism of cellular protoplasm in general and of nerves in particular is a bioelectrical type of mechanism (Sherington, Betcherew, Kappers, etc.)

From the discovery of Galvani to the research of Helmholtz on the propagation rate of nerves, to Athanasiu's recent work in Richet's laboratory on the circulating energy of nerves; from Newton's experiments and those of Haller, Matteucci, Helmolta and Pawlow on the ionic theory of nerve and muscle excitation, to the research of Ostwald and Kistijakowski who claimed that these actions must be accompanied by periodic variations in electromotive force; to the experiments of Fröhlich which led to the theory of the emission of electromagnetic waves by functioning neurons, to the more recent work of Lasareff who verified experimentally the periodicity of the current generated by active nerve centers, and who was therefore able to confirm by an indirect method, the theory of the emissions of electromagnetic oscillations coming from functioning cells; there exists within this chain of discoveries, a whole series of experiments, studies and very important research which bring us closer to the knowledge of the basic mechanics (bioelectric and electromagnetic) of the function of nerves and through them, of the brain. One must not forget these facts which the field of biology has established when one wishes to interpret physical phenomena in the field of biophysical research.

Nor can one deny that Lasareff showed conclusively that the emission of electromagnetic waves came from active nerve centers, and that their wavelengths were about 3000 kilometers, according to his calculations, as I said in my first paper. We see here that on the subject of the wavelengths of cerebral radiations, we are near to reaching the opposite pole from the inductions of the specialists in radio technique.

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"But are they cerebral radiations?" wondered Mr. Rene Sudre (Revue Metapsychique" No. 5, 1925 and "Mercure de France," 15 January 1926).

After having asked prejudicially if the use of the earphones which we have adopted permits us to be sure that we are free from auditory hallucinations when in our actual experiments we are dealing with such weak signals," and after having asked if the shielded cage is inaccessible to electromagnetic waves of any wavelength, he expresses the opinion that my conviction that the source of these waves is the brain is difficult to prove. He says that "Nothing in physics permits us to state that the brain rather than any other organ like the heart or the bone marrow is capable of emitting hertzian waves."

Sudre thinks that, among other things, the emission of these waves seems to be produced, not in the presence of a thought, but rather in the presence of an emotion. He adds: "The difference is capital. Emotion is a fundamental phsyiological phenomenon; it is through the viscera that emotions are expressed." However, he maintains that the electro magnetic phenomenon is signaled by muscular energy. He regrets that I used metapsychic subjects and neglected normal subjects, which he thinks should give the same results whenever phenomena of emotive or passtionate nature are provoked in them, since they are simply muscular forces.

Concerning the possibility of auditory illusions on the earphones (the term hallucination does not seem appropriate to me) the signals on the galvanometer remove all doubt in this matter. About the inaccessibility of the shielded cage to electromagnetic waves, the experts did not express any doubts about my experiments in this regard, seeing that my instruments in the shielded cage are absolutely protected from electromagnetic oscillations of wavelengths capable of influencing them.

But the brain, heart, bone marrow or other organs, are they emitters of electromagnetic phenomena? Can the waves be deriving from visceral phenomena of emotion, or be simply muscular forces? As far as the

movements of the assistants in the shielded cage, that is, actions and muscular forces, the refutation is easy. During the aforementioned experimental counter-checks, we did not abstain from conversations and lively movements, of course keeping a little bit away from the instruments, yet the instruments were not affected.

Just as normal subjects do not influence the apparatus by muscular forces, I never observed any positive results coming from ordinary emotive or passionate manifestations, either during the first or the second series of experiments.

But if I caused oneiric-hallucinatory states in normal subjects (either by facilitating their spontaneous manifestation or inducing them through hypnosis), I obtained positive results with everyone of them with my most sensitive apparatus (O.VII) to the degree that I succeeded in inducing these states.

I did not conduct experiments with normal subjects at that time because I wanted to study them at length to see if there were any electromagnetic radiations corresponding to their states of concentration or mental fatigue.

I shall add that I had already reported positive results given by the stimulation of the creative imagination of a subject of high intelligence in my first paper.

However, Sudre's deduction is not confirmed, nor can we accept his emotive-passionate concept of the [illegible] phenomena, which are undeniably first and foremost psychosensory phenomena.

About the importance that emotion can assume in the production of radiations, because of the physicological fact which accompanies emotion, we must turn back a bit, even if only briefly.

If the Lange-James somatic theory of emotion had the great merit of reintroducing the study of the mechanism of the production and devel-

opment of emotion from the strictly physiological point of view, which cleared up certain of its aspects, this theory has unfortunately taken a preponderant position in the minds of psychobiologists, to the point of rendering the two terms, emotional phenomena and visceral reactions, inseparable; this always happens with good theories.

I must make reservations about the conclusion of Sudre that "it is through the viscera that we emote" to the extent that the external phenomena of emotion are over-valued.

On the other hand, Abramowski's conclusive definition of the psychogalvanic phenomenon which Sudre quotes as being "of corporeal and not of spiritual nature," does not contradict the interpretation of my results as we shall see in a moment.

Though it is too often neglected, the fact remains that the point of departure – sine qua non – of emotion is psycho-sensory, is cerebral. In fact emotion is impossible in a decerebrate, though he be sensitive and sensory; secondly, if we suppose a case where the function of all the senses has been abolished, we have thus closed the pathways of stimuli which alone can cause emotion. In the second case, however, it would still be possible to record remembered emotions, and emotions related to visceral stimuli.

There exists, therefore, a moment in which emotion can be reduced to sense perception; this means that at a certain stage, emotion is only sensory. Even though it all appears to be simultaneous, nervous current overflows and calls upon the whole vascular, visceral, endocrine and reception systems through the sympathetic nervous system, the amplified sensations, and so on.

On the other hand, it is common knowledge in psychobiology that somatic participation can be major or minor according to the subject, and varies within the same subject according to the moment.

There are also states of consciousness existing either prior to the emotional stimulus, or determined by its extreme violence, which reduce the visceral somatic resonance almost to nothing.

These facts, which can be easily verified psychobiologically, (whoever has lived through the neurological experience of the war will remember many clinical examples) should suffice to make one realize that it is time to be liberated from the exclusivism of the somatic emotion, phenomenon which I maintain can be clarified by research on cerebral radiations.

Sudre is of the opinion that the first series of experiments described in my report "seems to demonstrate that waves are emitted not because of a thought but because of an emotion."

But in the case of Maggi, we found absolutely no supremacy of the emotional factor over the purely psychic factor (it must be noted that current terminology, because of its simplistic schematism, is very far from the harmonious complexity of the biological phenomenon). I must thus say – always of course <u>with a grain of salt</u> – that if there exist psychic phenomena which are almost anemotive, they are precisely those of spontaneous trance, of Maggi's hypnotic state. The somatic state is clearly implied in my descriptive phrase: "the face empty of expression"; a reflexion of anemotivity, it is the only state which can be used to recognize and evaluate the emotive factor of the sensitive medium during her visions (hypno-hallucinatory state).

This is also true of states of spontaneous trance, with original composition and automatic writing.

We found subject No. 7 in the same condition during her hypno-hallucinatory state as we described her in the state of spontaneous trance. The confusion may have arisen from an expression of mine which caused Sudre to make the observation quoted above.

This is how the statement read: "When the sensory phenomena of subject 7 (hallucinatory visions superimposed on profound affectivity) became more intense, scratching and other such noises were heard on the ear-phones..." I should clarify this statement by adding that when I referred to the affective character of certain provoked hallucinations, I did not intend to refer to an emo-affective manifestation, nor to an emotive potential. I did mean that the latter could become one with the psychosensorial activity of the brain.

But there is more. The experiments which we did with subjects 8 and 9 (8 was hallucinatory in the acute state, 9 in the chronic state) gave positive results – as is stated in my report. Now, as far as subject 9 is concerned, I explicitly stated that we were dealing with extremely violent psycho-sensorial agitation, even though it is habitually deprived of emotive reaction."

I shall mention finally an experiment which I hope will induce Suáre to renounce his hypothesis concerning the possibility that one might attribute radiant electromagnetic phenomena to the "emotive factor." This experiment is part of the second series of experiments already cited.

I obtained positive results with subject M using apparatus O.VI. If we compare experiments I, II, and III, we see that the visions during which I detected emissions of electromagnetic phenomena seemed free of apparent emotivity – being only affective – and that on the contrary, when a clearly emotive reaction appeared, the emission of radiant electromagnetic phenomena ceased.

The condition of emo-affective charge or emotive potential corresponds in its first stage to emotion; but it leaves the sensory phase at the beginning, and should therefore be considered as completely cerebral.

* * *

In summary, the experiments which I performed after my first report convinced me more and more that we were in fact in the presence of "vibrations of the brain."

In fact, the psychic phenomenology of the subjects undergoing experiment can be reduced to a fundamental activity of the brain.

When the sensitive subject presents phenomena of metagnomia or pragmatic cryptesthesia, we are then in the presence of cognitive psychosensorial processes, outside the normal life of the consciousness, with some degree of perception from a distance.

One can say the same of the psychic process; it is the basis for phenomena of lucidity, without object stimulus, it is produced in a state of trance or hypnosis, and in the state of trance with composition activity and automatic writing.

Some of the subjects presented phenomena of definitely morbid, hallucinatory nature during the experiments, while others presented hallucinatory phenomena, spontaneous or induced, with auto or heterohypnosis.

It seems evident to me that either with Maggi or with the other subjects, we are in the presence of psychic phenomena of an eminently sensory-cerebral nature.

I shall mention here a plant which has recently attracted some attention for its telepsychic properties: the"yaje," the decoction of which was used by the Indians during their national religious ceremonies and which seems to cause a particular form of drunkenness accompanied by true-seeming hallucinatory phenomena of clairvoyance, telepsychic vision, etc.; and the "peyotl" – plant which causes the enchantment of the eyes – studied recently by the renowned French chemist Dr.

Rouhier. During well conducted experiments, "peyotl" was shown to be able to provoke in those who absorbed a measured dose of its extract in tablet form," a prodigious exaltation of the imagination and of visual mental representations; unusual functional psychosensorial associations (particularly colored audition); varied illusions; visual and auditory hallucination, etc." and to conclude as Dr. Osty writes, a harmonious and splendid psychosensorial activity, on the threshold of telepsychic vision.

* * *

And now here we are at the final point of the discussion: what is the organic-functional substrate of psycho-sensorial phenomena?

It seems to me that there is no doubt about the reality of the sensory zone of the brain nor about its anatomic-functional basis that the cerebral cortex in general and each of its parts in particular offer to psycho-sensorial phenomenology. Actually, our present state of knowledge in the field of cerebral physiopathology allows us to say concretely: that the sensory zones are not hypothetical like the representative centers (assimilated to Flechsig's associative zones, recently refuted by Brodmann's research) even though the limits of these sensory zones have not been rigorously defined, as many people assume.

Other important research in cytomorphology which confirmed the presence of polymorphous cells in the deep layer and of small cells in the granular layer inside the sensory zone, and of their important connections with the other layers, restored to that zone decisely its proper dignity of function which seemed to have been attenuated by the predominance of Munk's theory and Flechsig's views according to which the representative centers and the centers of perception were supposed distinct, while the sensory centers would have conserved no trace of sense impressions received; these sense impressions would have been transmit-

ted to a transcortical representative center to be deposited there as symbols.

This concept of Tanzi's, the neuropsychiatrist of the Florentine Athenaeum, of the supposed symbols which are depositived in the supposed centers, corresponds, according to the apt expression of Brugia, "to Lugaro's idle conjecture of a supposed chemotropism of the supposed articulations between neuron and neuron," conjecture to which I shall return a bit later. Roncoroni and Marinesco's research has shed much light upon cortical psychosensory activity as I mentioned in my first report; this research has clarified the representative mnemonic significance of the polymorphous layer, which coincides with its development in the essentially sensory zone, where the transformation of the sensory processes into mnemonic processes is important. Thus it is demonstrated that near the zones of sense reception are located only those cells to which we can legitimately assign, by virtue of their structure, the function of elaboration and synthesis of sense impressions.

That doctrines so lacking in foundation as are those of the Tanzi-Lugaro school as far as hallucination and the origin of psychic processes in general are concerned, continued to be expounded under the heading of true facts, until their sudden collapse under the death-blow of criticism and experimental data, is in the usual chain of events.

To return to Sudre, it is a fact, therefore, that psychosensory phenomena have as their organic-functional substratum the brain; that the electromagnetic oscillations detected by my instruments were in strict correlation with the psycho-sensory phenomena of the subject; and consequently that the definition of "cerebral radiations" or as Sudre prefers "vibrations of the brain" is fully justified.

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M.E. Free's complete and precise critical study of my first report was published in The New York Times. Free will find, in the preceding pages, my reply, which I hope is complete, to the sharp criticism of the technique of the research, the problems to be solved and the difficulties to be overcome. I shall reply here to another series of interesting observations which Free made. He asserts first of all that I think that I have explained the phenomenon. I must say without equivocation that in my first report I stated precisely that "the existence of electromagnetic phenomena radiating from the brain poses many problems to which we must return" when we know more about the nature and characteristics of these electromagnetic phenomena. We must examine the following categories of facts: dreams, hypnotism, real thought transmission, accidental or experimental telepathy, etc."

To be truthful, I wanted to be prudent in my confrontation of the observed psychic and metapsychic phenomena, and in the correlative experimental results; thus I was careful not to go beyond the verified physical effects to the profound causes of these phenomena.

Free in his brilliant analysis showed correctly that "nervous action is electrical in nature"; he cites the impulses which travel along the sense and motor nerves during their so-called automatic reactions, such as the phenomenon of the transmission of visual impressions from the retina to the brain, and comes to the conclusion that the activity of the brain itself is probably electrical in nature.

It is worth recording here that Lasareff did very important research on the activity of the retina – considered to be the neurocerebral region which is the most accessible to stimuli from the external environment – research from which is derived the confirmation of the theory of the emission of electromagnetic waves by functioning nerve cells.

But Free is preoccupied with the fact that along with the cerebral electric waves, one can also detect waves emitted simultaneously from other parts of the body, so that it seems almost impossible to detect cerebral radiations "in all their purity and fullness."

In fact Free writes: "The electrical action of the living human body cannot be reduced simply to the pasage of messages between the different brain cells and along the nerves. The muscles, the internal organs, the blood, the heart, all are accompanied by numerous electrical discharges, and by the most complex changes. We are veritable electric machines."

As we can see, we are returning here to the end of the question which Sudre asked and which we have already discussed. It is strange, however, that one point of the experiments which directly favors the cerebral localization of the detected electromagnetic phenomena should be ignored by my esteemed critics. That is to say that during the presence of one or more persons in the shielded cage, the activity of the internal organs, blood, heart, muscles, etc., of these persons continued without the apparatus being influenced. This fact, though it does not exclude the possibility of the wave emissions of which Free speaks, (and which could be justified by the extreme weakness or by the insufficient sensitivity of the apparatus) does remove all doubt in the former matter.

The preoccupation with the notion that the radiations whose signals were received during my experiments could come from the activity of the heart, muscles or other organs, as well as from the brain, is therefore untenable; Free's affirmation that the detected radiations, supposed stronger and more intense than electromagnetic oscillations coming from the brain, could be coming from the heart or from the muscles, falls at the same time.

That the detected emissions of radio waves could be attributed to small unconscious muscular movements which accompany mental activity, or to the circulation of blood in the brain, or to simultaneous variations in cardiac rhythm, must also be excluded, since my instruments remained insensitive to much more violent muscular movements than the simple blood circulation in the brain or an emotive cardiac excitation.

Free moves farther out when he closely relates the metapsychic phenomenon of telepathy to my research. I must reply to Free in all exactitude, first of all, that my research encompasses not only the narrow question of telepathy, but a whole group of metapsychic phenomena concerning the psychosensorial activity of the brain especially, that I have grouped for purposes of distinction under the heading of telepsychism which comprises the phenomenon of accidental or experimental telepathy.

I cannot follow Free's detailed analysis of the telepathic phenomenon here, nor of the arguments for and against its veracity. Let is suffice for me to counterpose to the doubts expressed about the reality of the telepathic phenomenon, not only the well known case histories verified and rich with irrefutable observations, but also the more recent experiments performed with impeccable scientific rigor at the International Institute of Metapsychics, experiments whose positive results constitute the best confirmation of the reality of metagnomia or human crypesthesia (telepsychism).

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The rigorous and limited evaluation which I made of observed physical phenomena related to specific psychic and metapsychic phenomena, was on the contrary, perfectly understood by Bird, who in an interesting article quoted by European scientific journals, victoriously com-

batted certain a priori negations which are the fruit, as I said and demonstrated, of superficial criticism whose inconsistency I shall prove.

Bird maintains that the fundamental conclusion of my first report is that the subjects upon whom I performed by experiments when in a specific psychic state, emitted electromagnetic waves from their brains, and he realizes that I abstained from formulating any other conclusions.

But reflecting on the possible deductions of readers, that radio waves might constitute "the specific means for transmission of thought, telepathy, cryptesthesia and clairvoyance," he concludes with the expression of his own interpretation, that detected electromagnetic oscillations can be considered not as a mechanism for the transmission for telepathy, cryptesthesia, clairvoyance, hallucination, etc., but only as a collateral effect of a psychic state.

Nevertheless, he adds that psychic or metapsychic phenomena during which electromagnetic phenomena arise, necessarily constitute a mental state, which can be reduced in the last analysis to an electrical condition or to a series of electrical reactions.

We shall seelater that Bird's conclusions are heightened by more recent views on the psychophysical activity of the brain.

* * *

Tischner, who maintained a prudent reserve in his first critical article, came out recently with a series of observations tending to annul the logical interpretations of the experimental results.

It seems that Driesch, in an article which I regret not having before me, and to which I shall return, received Tischner's observations with pleasure, since he also bases his thinking on premises from biological physiology.

Driesch later offered special arguments opposing psychomechanic

parallelism, which theory would only constitute, according to this author, the basis for a physical theory of parapsychological phenomena. He writes in fact: "Today thereis a second parapsychological theory which thinks it can explain telepathy and thought reading by physical rays (radiations), almost believing to explain them by electromagnetic waves originating in the brain of the receiver. Naturally, this theory is purely physical, and only makes sense in the field of psychomechanical parallelism, which was formerly very important in psychology."

I believe that I myself presented psychomechanic parallelism as being highly improbable. But that does not matter for the moment; I shall try only to show that even in the case where parallelism does hold, telepathy and thought reading still cannot be explained by its principles. Since Tischner has thoroughly analyzed this state of affairs, I shall add only one point which I feel is important.

From the point of view of parallelism, one would see a natural specific state formed in the brain of the transmitting agent at a given moment, which corresponds to the event that he knows; one would see radiations emitted from his brain which produce the corresponding material state in the brain of the receiving agent. The receiver should consequently experience the same event as the transmitter, but we are sure that this is not precisely the case, and this is why the radiation theory falls through.

Let me quote an example: a man who finds himself in grave danger thinks of his mother, and the mother, let us suppose, sees the apparition of her son. The mother is not thinking about herself, nor does the son in danger see this own apparition! Yet this would be the case if we followed the parallelistic theory.

I will begin with Tischner. Tischner will find in the preceding pages the complete description of the experimental conditions, the re-

ply to the critical observations about the instruments, and the description of the second series of experiments which eliminates – by contradiction – the supposed different sources of radiation, and permits us to affirm even more forcibly that their origin is cerebral.

Like Free, Tischner erroneously attributes to me the intention of orienting my studies toward the discovery of the mechanism causing a particular parapsychic phenomenon; visions from a distance or truthful hallucinations.

I have declared the real direction of my research and therefore the opinion that parapsychic phenomena are the result of radio waves, which has been attributed to me should correct itself (this is an opinion which I was very careful not to express) just like the opinion which Tischner erroneously attributed to me: "Maggi's visions from a distance are attributable, according to Cazzamalli, to waves without wires." I must therefore repeat once again what I have already written about the interpretations of one of Maggi's visions (the description of the Italian parliamentary session) and I described the more recent vision in this paper along with the second series of experiments (metagnomic description of a lady), both of these visions having occurred within the shielded cage.

Tischner, wishing to give a touch of pure criticism to his argument, ends up by falling into a false interpretation, from which he draws some illogical deductions.

He says: "either the vision of the medium is exact and the cerebral radiations pierced the walls of the shielded cage, implying that it is not impermeable to radiations, and is therefore useless; or the vision is a subjective phenomenon of the medium and then the noises heard on the earphones must have come from elsewhere; or the noises on the earphones are caused by radiations coming from the medium, and once

again it has not been shown that parapsychic manifestations are provoked by cerebral radio waves, since on the basis of our second hypothesis, we are not dealing with a parapsychic phenomenon."

I shall reply by referring summarily to some considerations relative to Maggi's visions, which I have already mentioned:

1) The indications of the medium are exact whether the parapsychic phenomenon developed with an objective situation at a distance (place or person described) or nearby (brain of an assistant in which a phenomenon of conscious or unconscious prevision could be produced before Maggi's entrance into the shielded cage) or again if this phenomenon be only the realization of a prevision of the medium, fruit of an unconscious cryptesthesia which had begun prior to her entrance into the shielded cage.

2) I have said and repeated to Tischner that the shielded cage is unquestionably impermeable to wireless radio waves and that therefore the experimental method is valid.

3) It has not been demonstrated whether the detected radiations are caused directly by parapsychic manifestations, or whether the observed phenomena are predominantly psychic in nature rather than parapsychic; these are problems which remain to be discussed, and which I have not represented as being solved. But that electromagnetic oscillations are radiated in relation to the psychic and metapsychic phenomena described, whose common substratum is found in a particular intense psychosensorial activity of the brain, is the central fact which I recommend once more to Tischner'a attention and to the attention of those critics who, like him, run the risk of getting lost in a byzantine discussion. As we can see, Tischner's dilemma is reduced to a false syllogism. As for the theory of psychomechanic parallelism which Driesch attacked, I have no motive for defending it, since I hever accepted it,

nor have I ever involved it in my experiments.

I cannot refrain from pointing out to Driesch that his example with which he wishes to indirectly oppose (that is by means of the criticism of the parallelistic theory) a dialectical obstacle to the observed cerebral radiations, has no value, not only in the face of my experimental results, but also in the face of the general thesis of telepathic interpretation.

In fact, the example was presented not in its live essence of truthful hallucinatory phenomenon, but as some dead corpse, coming to our notice posthumously, resuscicated in an empirical and suggestive manner for the purposes of our ego the spectator.

How can Driesch state that the "son in danger does not see his own apparition" when the psychic phenomenon of the cinematographic memory of the dying man – as a result of the regression of life – is precisely a true dream of the most important moments of his life, whose center is the physical and psychic ego, a dream which has the same life-likeness as we ourselves experience during ordinary dreams?

Now telepathic vision generally strikes subjects and the "fantasy" of persons to whom they felt very close, whose death is afterward known and confirmed. In this case, it would be absurd – and here we agree on the insufficiency of psychomechanic parallelism – to wish to liquidate the question with dialectically artificial examples.

An explanation must be sought, I think, first of all, from the knowledge which we have of the pscyophysical-cerebral mechanism, before we have recourse to bio-psychological or philosophical hypotheses.

Now just as it would be wrong to try to mechanize the psychic or metapsychic phenomenon in a simplistic fashion, and to be under the illusion that one understands it, it would be even more wrong to ignore scientifically observed data concerning the means of production of cer-

tain phenomena, to bypass these data, goaded on by biophilosophy.

Should one perhaps think (as Driesch would like to impose upon the partisans of the electromagnetic connection of cerebral activity) that since a biological phenomenon of telepsychic vision is produced, a zone of the cerebral cortex of the recipient by its own images, under the form of vibrations, with reproduction of the images of the agent?

Does not our common psychological observation show us that a minimal sense impression (a sensation of odor for example) can awaken a procession of images, causing a whole psychosensorial mnemonic panorama?

And in a profoundly affective sensory reviviscence (for example the image of the mother or of the wife, etc.) are we not present in it and with it? And is not each one of these reviviscences impregnated with our ego?

The mother in a state of reverie who thinks of her far away son, often succeeds in reconstructing the most lively and perfect image of him, as if nallucinating; but this image adheres precisely to the ego of the mother, so that one could say that while the mother sees her son at a specific time of this life (for example when he was a baby) she sees herself also near him in this rapid psychosensorial mnemonic act, (or so it often happens).

If in the field of normal psychophysiology of the brain, a slight, limited sensation or the reviviscence of this sensation suffices to cause a perceptive-hallucinatory panorama (associative, mnemonic or fantastic) then it is logical to suppose that slight vibrations, in so far as they constitute a sensitizing force, are sufficient to cause the complex cerebral reaction which we call truthful hallucination (telepathy), between the agent and the receiver, with the initial stimulus of the sensory cortex. The opinion held by Driesch and his example do not hold; I take the liberty to call his attention to the considerations

which developed prior to this concerning the interpretation of sensory, psychic and parapsychic phenomena through biophysics. While I was doing my research, my conviction grew ever stronger that only through a knowledge less vague and more precise of the sensory activity of the brain, would light be shed upon this group of psychic and metapsychic phenomena whose denominator is without doubt psychosensory.

* * *

There exist other theorists who since they have in their vitals a preordained conception of the phenomena of life, tend not so much toward the analysis of experimental results and to the deductions which these results might inspire, as toward the reaffirmation of their own theories, indifferent to their acceptance or rejection.

This is the case of Glogan who received Tischner's observations with pleasure at the beginning of his article (Magia naturale e panpsichismo [Natural Magic and Panpsychism]) and then ends by maintaining that "the psychic function is related to radioactive emanations, which is an important part of the explanation of the teleplasmatic and telekinetic transformation." Glogan shows that he understands the weak point of Tischner's argument: the error of opposing the physical to the psychic from where the a priori of the relation of telepathy to physical vibrations is derived, as is the arbitrary identification of the believers in physical vibrations with the parallelists. But since he finds that the thesis of human radioactivity is the best support for his parapsychic concepts, he accepts Kotik's hypotheses as unquestionable (1904) and M. Caan's research (1911) as definitive, in favorof the radioactivity of the organs of the human body with predominance of the brain over the liver, lungs, etc., going even as far as cadavers.

Now, if the hypotheses and research of those mentioned above were

confirmed, and if the results of their research on pulverized dead organs corresponded to some functional aspect of living organs – which cannot be stated today – this would still not suffice to entitle them to introduce deductive arguments against the results of my research.

Glogan and M. Herbertz along with him, another theoretical critic, who tends to interpret my positive results as "seemingly radioactive" will be glad to read that I have already made a detailed reply to Tischner about this as well as to other authors and that I shall speak more about cerebral psychobiophysics.

It is impossible for me to follow Glogan here, as he climbs from Plato to the philosophical authority of Bruno, Spinoza and Descartes, or as he goes from Aristotle to Driesch. Then he joins to this the profound conviction that natural magic offers the solution to all problems.

Driesch, Sudre, Tischner, Azam, etc., operate in the same manner but in different paths, and with different results in mind.

Driesch, Tischner, Sudre and some others find in the spiritualist current that is being renewed, the explanation of metapsychic phenomena, particularly ofthose phenomena called subjective. Sudre states that "in telepathy there is also a communication from soul to soul through space," and Driesch agreeing in this with Tischner and also with me, believes that one should not seek the explanation in "cerebral radiations" analogous to physical waves. Well though a spiritualist in the Christian sense, I view this invasion of transcendental tendencies into the field of experimental research with alarm; intrusion which is easy to make when we are dealing with extraordinary metapsychic phenomena which we cannot always explain away simply by our ignorance; this intrusion must be combatted. I greatly prefer to follow the example, in my metapsychic research, of two observers of different schools; Richet, the great

physiologist and the greatest among the living metapsychists, and Morselli, eminent neuropsychologist and biologist; these two have kept the human personality from which these phenomena emanate, concretely in mind while working on their studies and experimental research before forming theoretical concepts for the interpretation of parapsychic phenomena.

However, in my opinion, the results of my experimental reserach confirm the thesis that the denominator of metapsychic phenomena must be in common with the denominator of other normal psychological phenomena; that common denominator is the sensory cortex, in short the brain, whose activity we cannot, nay should not forget while we direct all our energies toward the intimate knowledge of its function.

It seems to be time, with our tendency to examine with all possible research methods, the unexplored profundity of human intelligence, to reject all community with yesterday's materialism as well as the pseudo-spiritualism of today.

The psychological point of view of mental (cerebral) activity which experimental results suggest and nourish, do not contradict the final concept of the Supreme Intelligence.

We should therefore seek to solve, as far as this is possible, the problems related to human psychic and metapsychic activity, but without denying that the functional organic substratum of psychic activity is the nervous system and particularly the brain.

* * *

The point at which we have arrived with the second series of experiments in our research on cerebral radiations (the third series now in progress, has given even more evident positive results) imposes some deductions.

Either the results appear in contrast or in contradiction to all that science has told us about the functioning of the mind, in which case we must not repudiate it as misoneism would have us do; we must repeat, verify, perfect our experiments down to the last wave, until we arrive at a firm conviction, which implies revision, either of the experiments or of certain current ideas which are found to be in contradiction with them.

If on the contrary, there is no contradiction between the results of the research and current knowledge of cerebral physiology, then it is time to seek a point of contact and relation, in order to continue our research with greater clarity.

I have already mentioned the decisive orientation in the bioelectric and electromagnetic direction that the study and experiments on nervous function are putting more and more into light.

In a vigorous chapter on the electromagnetic mechanism of nervous action, M. Brugia has recorded the ever more numerous and persuasive experiments in favor of this mechanism, and has contributed significantly toward the demolition of Lugaro's concept of the functional neurotropism of the central assonic extremities, concept derived either directly or by anaology from the research of Ramon y Cajal, Schiefferdecker, Kock e Demoor, Loewi, Bronkmann, V. Dam, Zendressik, Kappers, etc.

The work of these scientists which contains many precious elements of our knowledge of the relation between cerebro-spinal energy and hormonal energy, such as the transport of excitations and secretions, etc., were it regrouped and artificially transposed, could serve to give an appearance of truth to false theoretic views.

The neurotropism of functioning ganglionous elements, according to which all neurons would act by means of secretions coming from only a microscopic distance away on groups receiving other neurons and which

would thus explain all neuropsychic manifestations by associative processes, at least has the merit of originality. Brugia notes this, remarking that the idea was presented many years ago with the definition of the secretory character of the psychic function, by a great physiologist, Angelo Mosso, who expressed it as a simply inductive hypothesis.

Today, another great living physiologist, Patrizi of the University of Bologna, expressed prudent reserve on the discovery and interpretations of Loewi, on the basis of Patrizi's own previous research and more recent interesting experiments; Patrizi demonstrated the stupidity of trying to extend the humoral hypothesis to other phenomena of inhibition, either peripheral or central; he also assumed the reality of Loewi's cardiac hormone to be outside discussion. He called attention, correctly, to the opposition between the rapidity of inhibitory acts, and the relative slowness of humoral actions. Now it seems certain, as I have said above, that an excitation can call into play many representations by the process called associative, with greater rapidity and variety than would be possible with biochemical processes.

The absolute insufficiency of a mechanism based upon a humoral product becomes more evident when one thinks about the capability which the human intelligence has of outlining rules of conduct for its immediate consciousness on the basis of past experience; in this psychic process the whole brain is overrun with excitations in a consonance of energetic action and reaction.

Kappers' research gives indirect support to these views. The doctrine of neurobiotaxis concerns the tendency of nerve cells to turn toward the richest source of stimuli and the drawing together of neurons in a state of functional excitation, either simultaneously or immediately afterward. Agreeing with the bioelectric interpretation, Kappers holds that there is in the neurons a sharp polarization with

accumulations of cations on the internal surface of the cylindrical processes and accumulations of anions on the internal surface of the protoplasmic processes and the cellular body.

Since the external surface has an opposite charge, the cations could eventually pass to other neurons, and the functional activity would serve to maintain the electrical polarization.

We must keep the data which we have on the processes of the reactivity of living protoplasm in general and of nervous protoplasm in particular in mind, and we must remember their tendency toward a bioelectric and electromagnetic mechanism of nervous action.

Onimus is right to assert that "there is no life without chemical action, and there is no chemical action without production of electric current." And Brugia is also right in asserting Mendelsohn's doctrine based on "the principle from pure physics that any collision, any disequilibrium, and material movement produces molecular dissociation and an ionic discharge causing ions of opposite charge to collide and unite to form new molecules; the other ions remaining or becoming unbonded, carry a (negative) electric charge "as electrons or electric atoms, or produce static energy if they remain immobile, magnetostatic or continuous current if they have a uniform flow, and electromagnetic energy if they move without uniformity or periodicity. According to Mendelsohn then, the electromotive force of organic life is caused by ionization of colloidal electrolytes, which are charged colloidal ions of high potential. This concept refutes Nernot's theory of the concentration battery, and Ruffini completes the refuation with the accurate conjecture that nervous current should follow the law of cellular polarization (as does nutritive, anabolic and catabolic current) creating a magnetic field round itself, and causing a true electromagnetic current as does any potential in motion; only their velocity is weakened

since they are particles which do not have the impulse of pressure or intensity. According to these principles, nerve conductivity would depend not upon some homogeneous process, but upon a series of processes (chemical or mechanical actions, ionization of colloids, differentiation and lowering of potential, formation of microscopic current) which unite excitation to reaction similar to the successive phases of a complete dynamic phenomenon; this, in full harmony either with the slowness of nerve transmission, which badly interpreted by Helmholtz, renders him an adversary of electrobiology, or in full harmony with the observation that galvanic current has no effect on nerve or muscle if it does not run along the length of their fibers.

Now the intrafibrillary junctions act as separating surfaces, as Sherrington deduced over twenty years ago; that is, they act as membranes to maintain the osmotic pressure and the dialysis of the free ions, to condense electricity, and to influence the surface tension by varying the difference in potential or modifying this influence upon it, by holding separate solutions of different concentrations, or two colloidal suspensions of different charge: "dynamism barely perceived up until now, still unexplained, but which promises the explanation of numerous nervous and psychic phenomena."

This movement of ions, accompanied by bioelectric variations, with the consequent electromagnetic oscillations, seems to be the most plausible basis of action from a distance – not humoral but electrical – of nervous elements; the fact is that histological reality lies with Golgi's diffused net rather than with Cajal's neuron discontinuity, though Donaggio's small endocellular net seems to facilitate the interpretation.

Thus on the one hand, its importance lies in the volume of a large number of nervous elements, and on the other hand, the immense number (more than five and one half billion) of cortical cells, true

supply houses for the psychological need to receive and store numerous electrons, according to the physical law that electrical capacity is proportional to the quantity of material decomposed.

Only an abundance of such fantastic elements operating in perfect harmony could comply with the prodigious elaboration of the innumerable varied, profound and detailed psychic dynamisms.

"The fact remains" writes Bechterew, "that each cerebral center is a storage battery of energy, which permits it to remain inactive until this latter has reached a certain state of tension; it simply stores the current which continues to flow into it."

Why should not electrical current in the brain, then, act as does any electrical current, causing a magnetic field round itself with induction on its inactive diastaltic arcs?

Lasareff, relying upon the theory of electromagnetic radiation, explains the reinforcement of the auditory sensation in the case of simultaneous irritation of the eye; reinforcement discovered and studied by Urbanohitsch.

I see no more persuasive interpretation for such phenomena than that of colored audition. Loeb's words are still appropriate to the subject of associative memory, that is, the process of sensory resonance: "There exists today a tendency to consider the anatomic and histological study of the brain as the most promising way to analyze these functions. It seems to me that to wish to account for the mechanism of associative memory by histological and morphological methods, is to try to explain the dynamics of electrical phenomena by the microscopic study of the transverse sections of a telegraphic wire, or by enumerating and mapping the telephone lines of a large city."

In reality, experience showed a long time ago that the reflexes were joined to the sensory mechanism and between this and the instru-

ments which expresses it, conductivity appears as the general property of the relation; while coordination, memory and association do not have a great importance except as they are translated into a composition of forces.

When the excitations leave the sense organs in a cellulipetal direction going toward the sensory cortex, as when they arrive from the motor cortex at the motor or glandular organs in a cellulifugal direction, the energy invoked cannot be assumed to be specific and of a mechano-humoral nature, but aspecific and of electrical and electromagnetic nature, since specificity seems to be the property only of the sense receptor organs, the glandular and motor organs.

How can one exclude the possibility with the direct and indirect knowledge which we have at hand on the mechanism of nervous action that the brain has at its disposal alternating current, electrical capacity, autoinductive circuits, that is the possibility that it produces oscillatory discharges and consequently, electromagnetic waves?

Most of the XVII century scientists believed that nervous manifestation was none other than a biological form of an electrical phenomenon.

Much that dies is reborn.

Well, if an obstacle can be placed (by the solution of the problem that biophysics cannot and must not ignore) before the attempt to interpret, to detect these material processes, which accompany the physical development of cerebral activity in space, in the form of electromagnetic waves, it is the defect or the insufficiency of sensitivity of the receivers chosen.

Are we not each day better equipped to deal with the exacting techniques with the perfecting of the thermoionic tube, which proves to be marvelously sensitive to weakened waves?

* * *

There is another question which arises about the results of my experiments: why is it that during mental activity no radiation of electromagnetic oscillations are detected?

It should be sufficient to reply that in such ordinary activity the waves are infinitely weaker than they are in the state of exceptional psychosensory excitation, so that the present techniques would never be sufficient to the task of detecting them.

But for their greater satisfaction, I should like to submit to the critics' attention an experimental fact which gives support to the evident fact that the radiating capacity of the brain is stronger when the sensory activity is developed to a maximum by certain psychic and metapsychic phenomena; these are those toward which my research is directed.

Relative to my first series of experiments, I have already mentioned that the noises on the apparatus began when the sensitive-medium entered into a state of trance, and that the noises became strong at the moment when a rather accentuated hypno-hallucinatory state began or ended.

In the second series of experiments, I wrote that during effective hallucinatory phenomena and in a potential state of charge or emotional tension, there arose uncontestable electromagnetic phenomena, while when the emotional manifestation, i.e., the level of the cerebral tension, fell off abruptly, discharging itself through movement and the glands, the radiant electromagnetic oscillations could no longer be detected by apparatus O.VI.

Having read Brugmans' work on the passive state of a telepath, verified by the psycho-galvanic phenomenon, I was able to state that this "passive state," that is, the sensation of passivity, corresponded clearly to the state of slight trance in the sensitive medium (to a new state of consciousness that is different from the ordinary state) and in all

probability, corresponded also to the degree of cerebral tension of sensory supercharge (with rather strong emo-affective potential), prelude to hallucinatory manifestations.

Well, Brugmans noticed that in the "passive state," the deviations are stronger than in the normal state. The curves also show that the subject is acutely aware of the realization, not only of the disappearance of the passive state.

For that reason, the fact that certain changes in our state of consciousness are objectively shown by the so-called psycho-galvanic phenomenon, seems to me not without significance, in as much as it agrees with the objective check which I was able to make upon my sensitive medium, in relation to the variable conditions of metapsychic activity, in whom the passive state, similar to the slight trance is the first expression.

In this manner, the relation between the degree of cerebral tension of the (with variable emo-affective potential) psychosensory hallucinatory superchage, and the radiation of the electromagnetic oscillations, lends credence to a greater cerebral radiation for determined psychic and metapsychic phenomena.

The question is only sketched out here but it merits profound experimental study.

I shall refrain from indicating the motives for which entire categories of facts such as dreams, hypnosis, thought transmission, experimental and accidental cryptesthesia should be submitted to serious revision in consideration of the recent findings of cerebral psychobiophysics. I am convinced that only the penetration into the heart of the sensory physiopathological mechanism will permit us to advance in our comprehension of the phenomena of memory which is the basis of the ego, of consciousness.

Recently, a noted French scientist, Daniel Berthelot, expressed clearly his opinion on this subject: "How can one doubt that there exist in the universe an infinity of other vibrations still unknown to us, which our sons will discover in their turn? It would not be surprising if it were true that human thought had an external manifestation under the form of "electric waves, analogous to those of the wireless telegraph, using, like the wiereless telegraph, only a minimal quantity of energy, but capable of being detected by sufficiently sensitive detectors."

Once the terrain has been cleared of hypotheses, theories and speculative inductions, nothing should remain for the continuation of research except naked objectivity, a definite number of phenomena to sound out, according to a specific method, using every possible technical improvement. Critical observations, let it be well understood, are and always will be the best stimulus for accuracy in experimental research.

Paul Brenot expressed a prejudicial opinion agreeing with Free, Bird, Azam and Sudre: "Such experiments are without value unless checked by an engineer of the wireless telegraph (radio) of the first order."

I have the great satisfaction to declare that the third series of experiments, already partially completed, and which is at present continuing was developed and continues being developed with the able collaboration and control of the doctor of engineering, Eugenio Gnesutta of the Milan Polytechnique, eminent specialist of the wireless telegraph; Mr. Ferdinando Rosa, esteemed technician of the department of physics of the polytechnique is constructing the new receiving apparatus O.VII (for radio waves of 70 to 50 centimeters) and the recording apparatus under Dr. Gnesutta's direction.

Our objective of a first photographic recording of cerebral radia-

tions has been attained, even though it is rather rough.

I hope to adopt a much finer and more sensitive recording apparatus soon.

My experimental research is continuing.

APPARATUS VII

Receiving apparatus O.VII consists of a whole complex of receivers, amplifiers and recorders (Fig. 4).

Receiving apparatus (A) (Fig. 5) consists of a complex triode oscillator for frequencies varying from 60,000 K-cycles up to 400,000 K-cycles (waves of 5 meters to about 70 cm). This complex oscillator is the only one capable of detecting electrical oscillations in these wavelengths;it is appropriately joined for this purpose to the aerial system for detecting oscillations (direct and indirect coupling) and placed more or less in the vicinity of the experimental subject. The oscillations detected by this complex are then amplified by a normal amplifier (B) (Fig. 6) for low frequencies of the transformer type, and these detected and amplified oscillations are then passed to a wave rectifying apparatus (Fig. C) to be recorded by means of a special recording device (Fig. D) (Fig. 7). This device consists of a galvanometer with a mobile coil and a pointer, on whose extremity is placed a small and very light screen in the center of which a small hole is made underneath the screen; under this a photosensitive film is exposed in a clock-like movement, whose rapidity of impression is adapted to the apparatus. A light source placed above illuminates the screen, and the light beam is projected on the sensitive paper, thereby describing a curve. (Fig. 8).

The principal reason, I repeat, that I was led to use special human subjects (those exhibiting strong visual and acoustical sensoriality, sensitive subjects with cryptesthetic properties, neurotics,

Fig. 4. Apparatus O.VII.

Fig. 5. (A).

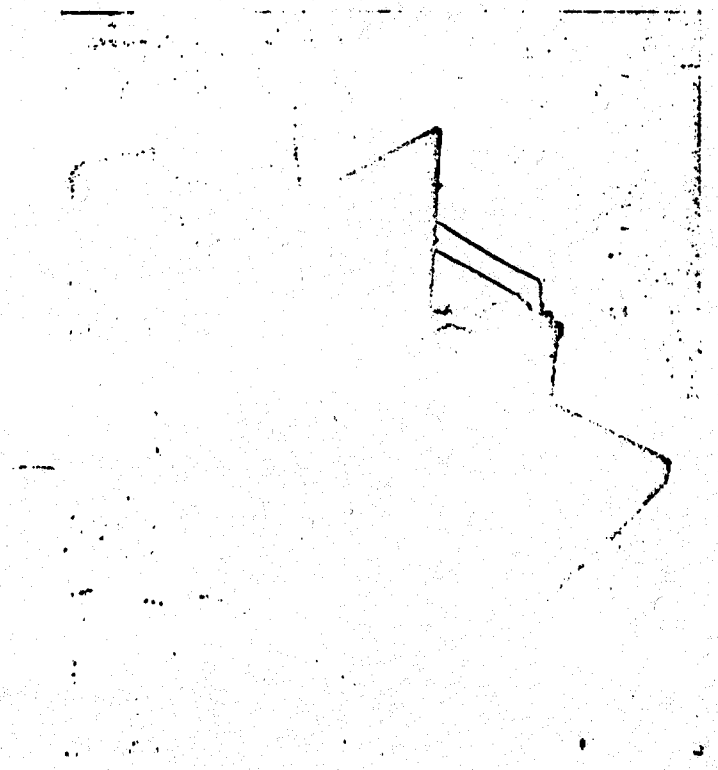


Fig. 6. (B).

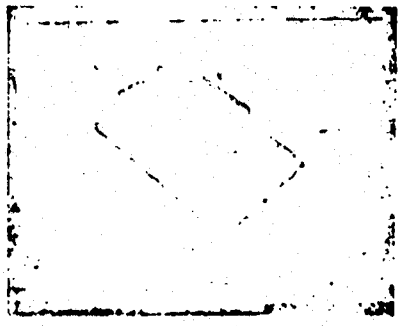


Fig. 7. (D).

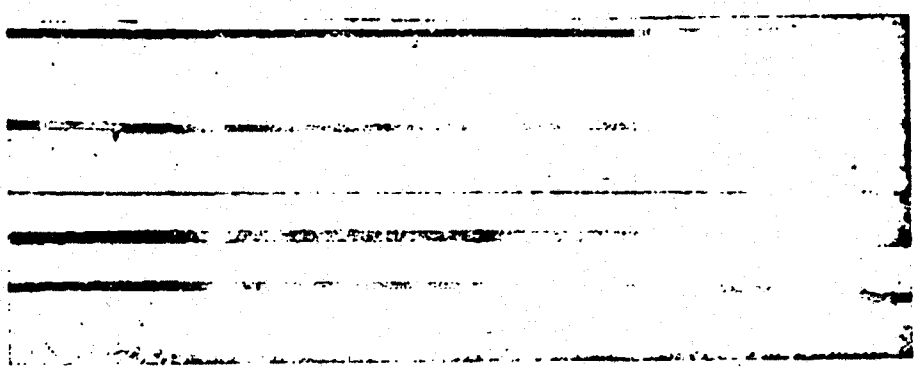


Fig. 8

psychoneurotics, hallucinators) is that they exhibit conspicuous psychosensory phenomena with extreme facility (visions, auditions, etc.), either spontaneous or provoked (trance, auto and heterohypnosis, etc.), which can be followed and even guided in their development, and which mark an extremely lively dynamism of the sensory brain.

In the shielded cage, the subject reclines upon a chaise longue, I sit down next to it, (one or more assistants are seated nearby) I can easily await the functioning of the apparatus without neglecting the subject.

When I find the moment propitious, I start to expose the film.

The antenna used consists of a copper wire which runs about one meter above the body of the subject, parallel to it and attached to the

walls of the cage with raw silk bands supported by the wainscoting.

Everyone knows the delicate precautions required when one is experimenting with extremely-short-wave receivers. During my experiments, I have borne these precautions constantly, strictly and rigorously in mind.

It must be recorded here that the galvanometer needle never deviated due to the presence in the shielded cage of two, three or four persons.

While movements, I mean of course slight, careful movements, and conversations of the subject and experimenters did not cause appreciable disturbances in the apparatus, when experimenters and subject were absolutely calm, when particular psychic or telepsychic phenomena developed, and then only in correlation to them, the apparatus was sensitized and signaled the reception of electromagnetic waves.

Of the only subjects of whom an account has been given in this report, some presented, during the experiments, of course, hallucinatory phenomena of morbid nature, others presented spontaneous or provoked auto or hetero hypnosis, including an experiment with a peyotalized subject. Peyotl, as I have said, is the plant which produces stupendous true-seeming visions during the conscious state and without secondary toxic phenomena.

The oneiric-hallucinatory conditions characteristic of psychosensory phenomena are extremely favorable to positive experimental results.

I chose many positive films for my II report to the Congress of Paris though I did not fail to mention the overwhelming number of negative films, caused by the absence of psychosensory phenomena or by their extreme weakness.

It will be enough for demonstrative clarity to report on one posi-

tive film here, the first, though it is still rather rough, human radio-cerebrogram.

1st Film (Fig. 9) – Subject M.A. hysteric, auto and hetero-hallucinable. The curves of the first line correspond to the hallucinatory recall, with affective involvement, of her son. The second and third lines with curves and black circles correspond to vivid visual hallucinations of dead family members (uncle, grandfather, great-grandmother) with acoustic hallucination of imperative suggestion by this latter.

The black circles take the place of the curves when the deviation of the galvanometric needle is such that the light beam is completely uncovered.

The best results were obtained up to now with complex oscillators made to detect electromagnetic oscillations of extremely short waves of about one meter.

We shall try new antennae, consisting of spirals placed around the subject's head, or around his whole body, or a special occipito-temporal plate, always appropriately isolated and out of contact.

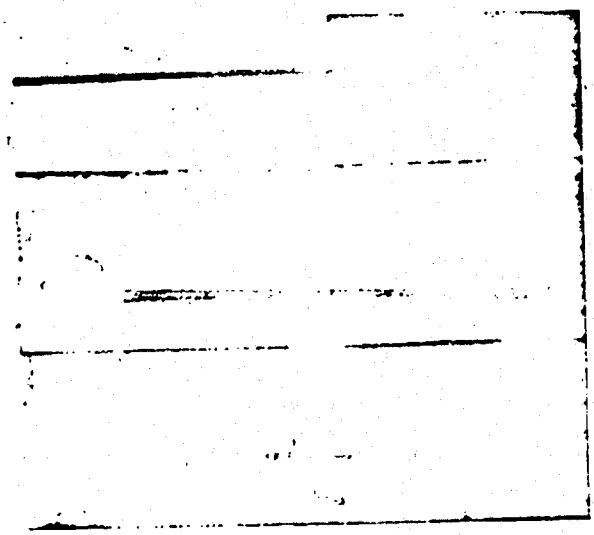


Fig. 9

There is still the acoustical control of the earphones besides the visual one of the galvanometric needle, whose excursions are recorded in the manner described. On which subject I should mention the noticeable inertia of the recording apparatus now in use; several times there were well-marked sound reactions on the earphones which corresponded only to very small oscillations of the needle or even to its absolute immobility.

So these first films constitute very rough and imperfect radiocerebrograms. Experiments are already in progress using an Einthowen loop galvanometer, with a view toward obviating the inconveniences mentioned above, and other experiments are planned using photoelectric cell with a Whenelt tube, equipped with a special photographic and cinematographic apparatus. Moreover, another new complex oscillator has just been constructed, based upon the experiments already done, in the search to improve the arrangement of the various elements which constitute the circuit.

I really believe that with acquisition of a finer, more precise and more exact photographic and cinematographic representation of electromagnetic waves radiating in correspondence to specific psychic and metapsychic phenomena, one could experimentally affront still unexplored regions of cerebral dynamics, related to entire categories of facts such as the physiological and pathological psychosensory mechanism, the phenomena of memory, dreams, hypnotism, true thought transmission, and the phenomena called tryptesthetic or telepsychic.

The Report II which I gave at the 3rd International Congress of psychic research in Paris (26 September 1927) and which deals with the experiments done with O.VII called into discussion among others, the great physiologist Charles Richet and the noted biologist Hans Driesch who with expressions of flattering agreement, emphasized the importance

and the possibilities for development of the experiments done and in progress.

APPARATUS O.VIII

Apparatus O.VIII corresponds to Hartley's scheme and consists of a complex triode oscillator for frequencies varying from 60,000 K-cycles up to 400,000 K-cycles (waves of 5 meters to about 70 cm). This complex oscillator is the only one capable of detecting electrical oscillations in these wavelengths; it is appropriately joined for this purpose to the aerial system for detecting oscillations (direct and indirect coupling) and placed more or less in the vicinity of the experimental subject. The oscillations detected by this complex are then amplified by a normal amplifier forlow frequencies of the transformer type, and these detected and amplified oscillations are then passed to a wave rectifying apparatus to be recorded by means of a special recording device.

Oscillator, amplifer and rectifier are now joined into a single complex which is more stable and better protected. (Figs. 10 and 11).

The recorder which formerly consisted of a galvanometer with a moving coil is replaced in this version by a string oscillograph, with a method for photographic recording on film (Fig. 12).

I must add that the oscillator O.VIII is an autodyne, and is therefore useful for constant waves both pure and modulated, whose frequency must naturally be in interference with the waves of the apparatus at a certain moment; this is for the provocation of audible beats.

That it is only sensitive to damped waves, is shown, as we know, only if they are in exact resonance with the wave generated by the aforementioned oscillator.

I have stated elsewhere that there is some research derived directly from my own and other research independent of it, but these latter

agree biologically with the former.

In the former, Desoille, Skritzki and Lermontoff confirm experimentally the concept of the radiation by subjects, corresponding to specific states of consciousness (psychosensory) of electromagnetic oscillations, and from the other side, they attest to a certain influence of very short hertzian waves on sensitive subjects.

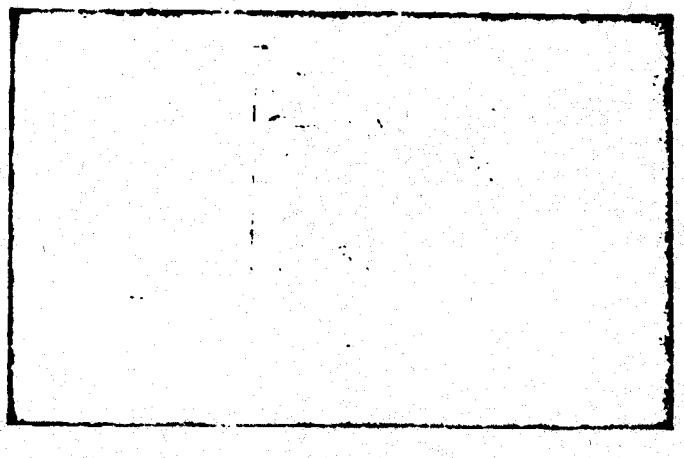


Fig. 10. O.VIII. front view.

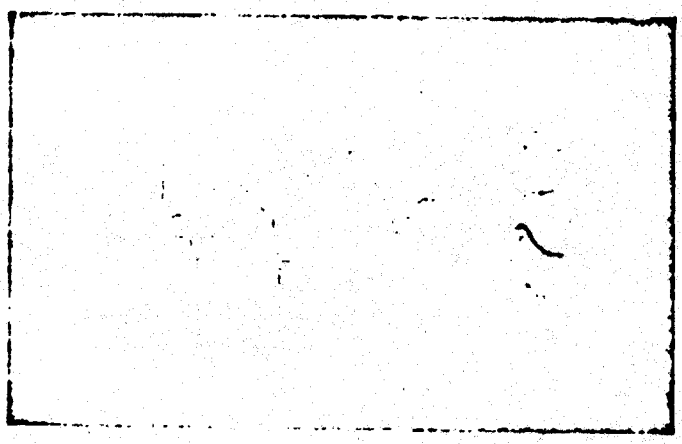


Fig. 11. O.VIII. rear view.

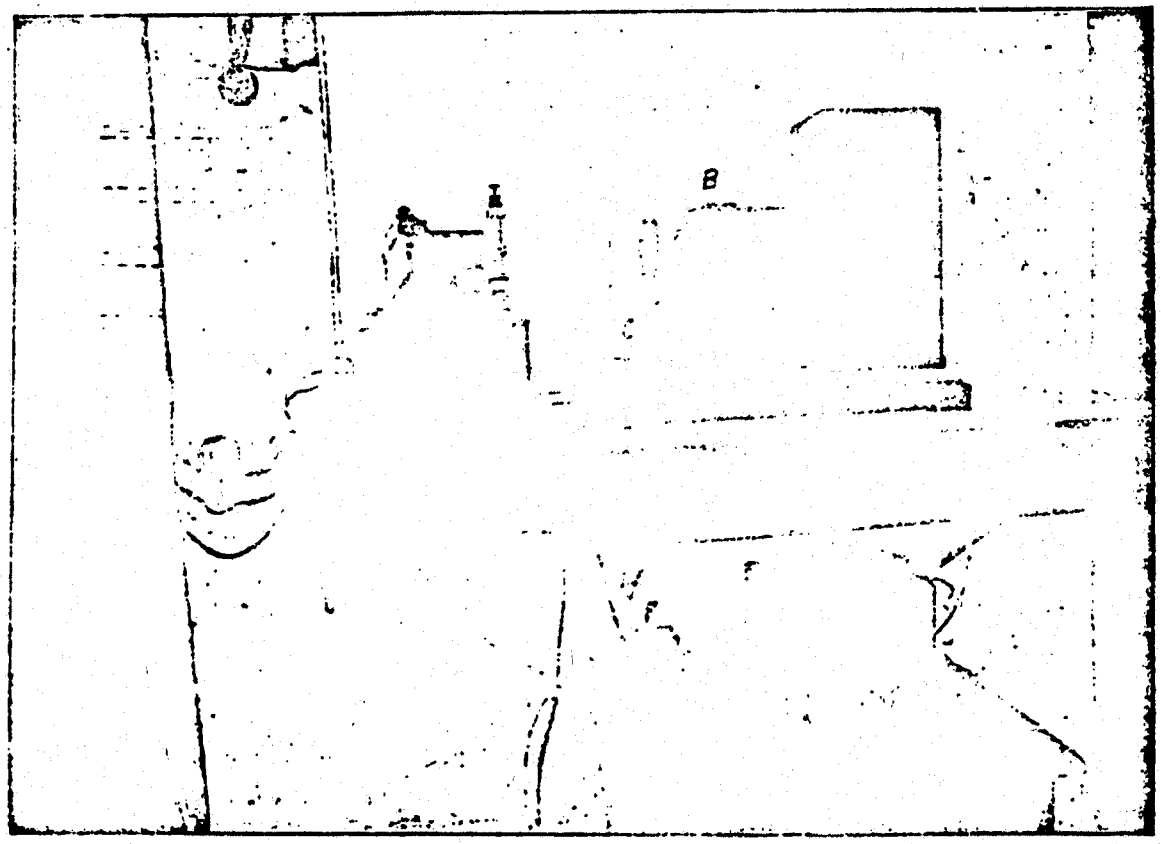


Fig. 12

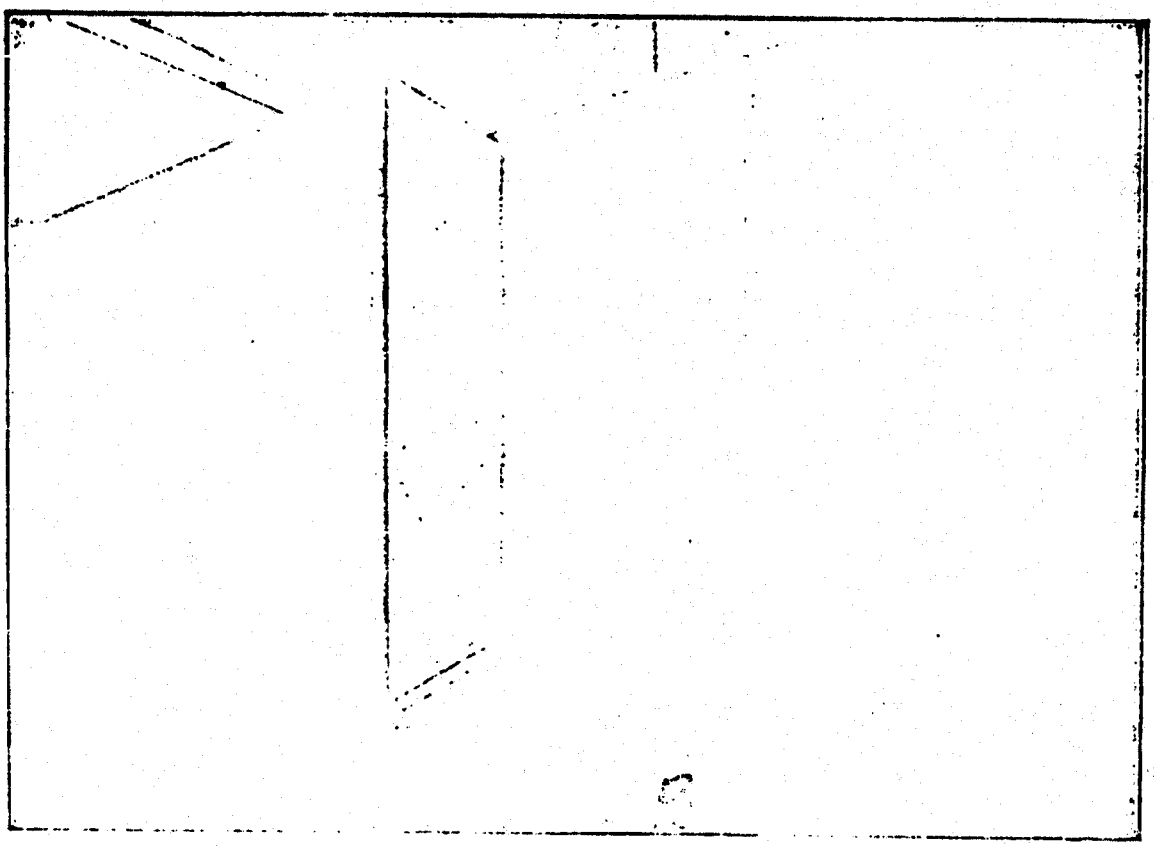


Fig. 13

Experimental research in biophysics which I have pursued for ten years, with constantly improved instruments for inquiry, with the aim of exploring some psychic manifestations of the human brain during their activity, has led me on the one hand to the discovery of electromagnetic phenomena, and on the other hand, to a new experimental method for psychobiophysical research.

DESCRIPTION OF THE EXPERIMENTAL METHODS EMPLOYED

To avoid the influence on the apparatus of electromagnetic waves circulating in the ordinary atmosphere, I always use a shielded metallic Cage, a true Faraday cage, which encloses the apparatus, the subject and the experimenters.

The shielded cage, whose length is 2.65 m and whose width is 1.65 m, and whose height is 2 meters, consists of a wooden frame shaped like a parallelepiped, covered on six sides with sheet iron 1 mm and 1/2 thick soldered together. The shielded cage rests on a fir table isolated from the floor of the room with porcelain blocks.

Three wires, soldered to three points on the ceiling of the cage are twisted into a single wire and attached through a switch to the water pipes so that the shielded cage can be grounded at will.

One enters the shielded cage through a small door on the outside which is equipped with a special closure. The cage is provided with a wooden floor over the sheet iron and the walls and ceiling are covered with cloth.

Attached to one of the lateral walls of the shielded cage by a wooden frame is a dark room (Fig. 13).

There is a divan, a table with oscillator O.VIII, the storage batteries for power, another small table and three chairs in the shielded cage.

The shielded cage is large enough to hold one to three experimen-

ters besides the subject.

The subject undergoing the experiment is partially or totally reclinced on the divan, while I am seated on a nearby chair, on the side or facing the subject, or on the edge of the divan; thus I can easily control the function of the apparatus at the same time as I watch the neuropsychic conditions of the subject. About 50 to 70 centimeters above the subject's body, and parallel to it runs the antenna, which consists of a copper wire attached to the walls of the cage; the antenna, insulated with raw silk, runs from the copper spiral of the oscillator, to which it is connected by an easily moved plug made especially for this purpose with screws.

Fig. 14 gives a partial view of the inside of the shielded cage with the divan, one of the chairs and the control table upon which the complex oscillator-triode for very short waves is installed. The switches which control the turning on of the complex oscillator and the other instruments in the shielded cage are on this table.

E — switch which produces a magnetic field on the oscillograph

F — switch which lights up the oscillograph

G — switch for marking the film with luminous dots

H — switch for starting and stopping the film

I — power supply.

O.VIII (eighth complex oscillator) with which the psycho-biophysical experiments were done, which will be described, corresponds, as I have said, to Hartley's scheme.

The oscillations detected by this complex are then amplified by a normal amplifier for low frequencies of the transformer type, and these detected and amplified oscillations pass to a rectifying apparatus to be recorded by means of a special recording device.

I must add that O.VIII is an autodyne, and therefore can detect constant, modulated and unmodulated waves, whose frequency at a given instant must be in interference with the waves coming from the apparatus; this provokes audible beats.

Since this apparatus is sensitive only to damped waves, they are only evident, as everyone knows, if they are not in exact resonnance with the waves generated by the oscillator.

O.VIII is tuned for oscillations of about one meter λ corresponding to a frequency of 300,000 K-cycles.

The oscillator, amplifier and rectifier are joined into a single complex stable and shielded unit, whose particulars are evident from the figures which give the front and rear views.

O.VIII is grounded with a copper wire connected to an internal wall of the shielded cage, and grounded in the manner described.

From the control table, it is possible to regulate the function of the apparatus in the dark room easily and precisely; this apparatus is connected to O. VIII through two small outside lead-insulated holes which prevent communication between the shielded cage and the dark room.

The recorder, as I have pointed out, consists of a loop oscillograph with a means of photographic recording on film, the particulars of which are visible in Fig. 12, and explained here:

a) loop oscillograph

b) light source

c) lens for concentrating the light rays

d) black box which encloses the film during exposure

e) shutter which when lowered exposes the film to luminous dots

f) power supply, transformer, rheostat.

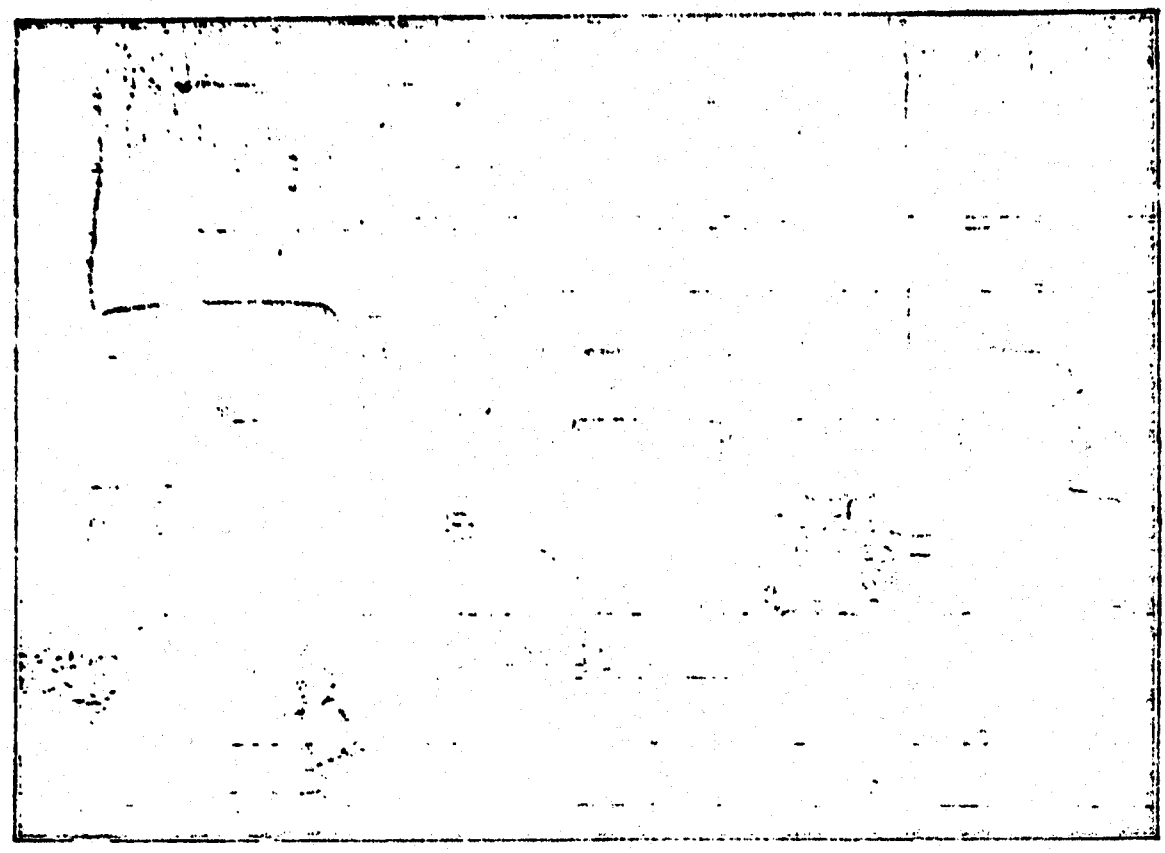


Fig. 14. The interior of the shielded cage.

TECHNIQUE AND EXPERIMENTAL DETAILS

The use of oscillators for very short waves requires much experimental acumen if the causes of imperfect functioning and error are to be avoided.

I must state that the capacitive and inductive disturbances due to body movements close to the instruments were absolutely and systematically avoided.

I have amply discussed the explanations of some observations advanced by P. Brenot, H. Azam, and E. Free.

We can put into this category the observations published in 1927 by Dr. B. Panizza on the influence exercised by the human body on instruments which detect and emit electromagnetic waves. We are dealing here, given the nature of the instruments employed, with the well-known

effects of capacity and induction, which have nothing to do with the electromagnetic phenomena which I observed and described.

Naturally, in order to do research by the method which I have adopted, unfailing skill is required to be secure from the outside influence of capacity and induction by placing the subject in a certain position at some distance from the complex oscillator so that his movements do not disturb the function of the apparatus, while experimenter and assistants maintain the greatest possible quiet to avoid disturbances which the apparatus might detect.

Another question already asked and discussed refers to the possibility of sound reactions on the earphones from the reflection by the walls of the shielded cage of ultra-short waves coming from the oscillator, that is, from disturbances caused by the atmosphere supersaturated with rather variable electromagnetic vibrations.

First of all, let me repeat that from the moment that the experiment is begun, we do not touch the apparatus.

But, for example, we did regulate O.VIII during the course of an experiment.

In conclusion, the possibilities of extrinsic disturbance were constantly and accurately eliminated, while all due attention was paid to avoid intrinsic disturbances by a severe, preventive check of the functioning of the apparatus.

I should also add that conversations and movements of the operators and the subject, slight, of course, and not too near O. VIII, never provoked appreciable disturbances in the oscillator, while both subject and experimenters were in a state of almost absolute calm, but when particular psychosensory phenomena occurred, the apparatus signaled the presence of electromagnetic phenomena without possibility of equivocation.

Also, numerous experiments allow me to state that when I was alone in the shielded cage, or with a subject, or with other experimenters when the apparatus was in full function for several hours, if no marked psychosensory phenomena were produced, there was no noticeable phenomenon of reception nor was there appreciable sensitization of the oscillator. That is, of course, being careful to observe the known experimental precautions with a scrupulous exactitude.

These experimental counter checks help also to show that there is simply no influence on the functioning of the apparatus in the shielded cage by the reflection of ultra-short waves generated by the oscillator, as opposed to ordinary normal air. This is in reference to the supposed possibility of a noticeable ionization inside the shielded cage.

The check of a possible marked ionization inside the shielded cage, depending not only upon the functioning of the apparatus and upon the presence of human subjects, but upon the particular electrical state of subjects having a particularly intense psychosensory phenomenology, still remained to be carried out.

In fact, the oscillator could detect a brusque change in the electrical current circulating in the atmosphere, change caused by ionization.

I therefore proceeded to an accurate check on the ionization state of the shielded cage, using the physicist, Prof. Murani's apparatus, similar to W. Schmidt's which is well known to electronic specialists, and which offers the great advantage that the electroscope remains outside the activated atmosphere, and for that reason, not only does it remain in a condition of greatest isolation, but the measurements are not affected by errors caused by the activation of the instrument.

The apparatus is composed of an Elster and Geitel electroscope equipped with an ionization chamber; this chamber is made of a metallic cylinder attached to the floor; the diameter of the cylinder is 80 mm, and its height is 110 mm.

The scale which measures the divergence of the foil is reflected by a mirror which closes the front of the instrument; the image of the scale is formed by the mirror in the plane of the foil in order to avoid parallax; this is the well-known method of Elster and Geitel.

The electroscope is attached to the cover of the ionization chamber; the rod which supports the aluminum foil crosses through an amber plug which insulates it and supports the collector or dispersor located in the middle of the ionization chamber; the dispersor is a metallic cylinder, 20 mm in diameter and 40 mm high.

The ionization chamber can thus be easily opened from the bottom.

I installed the Murani apparatus in the adjacent dark room and put rubber tubing into the shielded cage to draw the air from it into contact with the electroscope, always maintaining a constant voltage, equal to that of the control runs.

We made many analytical checks on the ionization state of the shielded cage: a) check on the rate of fall of a gold foil during one hour outside the shielded cage; b) idem inside the shielded cage; c) idem inside the shielded cage with the apparatus functioning; d) idem with human subjects in relative psychic calm; e) idem with psychically active subjects, that is with manifestations of typical psychosensory phenomena, for which the complex oscillator signaled radiating electromagnetic phenomena.

The fall of the gold foil in one hour within the shielded cage during psychic experiments whose physical outcome was positive, compared with results quoted in the literature on ionization research, in

the outside atmosphere, inside the shielded cage with the apparatus functioning and in the absence of particular psychosensory phenomena.

In other words, from repeated tests, I can state that the ionization state within the shielded cage is not substantially different from that of the outside atmosphere, whether the film be positive, negative or blank.

I need not mention that one must be sure of the condition of the vacuum tubes and of the power supply for the oscillator, and the string oscillograph; there must be frequent checks on all voltages, storage batteries must be systematically charged.

The radio-telephonic earphones attached to the oscillator complex are worn by the experimenter during the whole experiment.

The earphones provide a check on the apparatus before any test is begun; they assure the regularity of the electronic hiss from the tubes, and the absence of disturbances which could come from current or other mechanical causes, or from the condition of the tubes.

With the well known techniques, I managed to get a smooth static with O.VIII; the subject is then introduced into the shielded cage, and reclines on the divan, while the experimenter is in a position to be able to control the functioning of the apparatus, the state of the subject andto be close at hand to the command table, from where he can control the apparatus of the two rooms.

The other experimenters are seated next to the wall of the shielded cage which separates it from the dark room, and thus are able to observe the experiment easily.

We begin by starting the film.

We ordinarily use a red light strong enough to see the apparatus and the subject, and to take notes when the occasion arises.

When necessity requires, I use the common white light. The choice

of the type of illumination depends upon experimental psychological necessity.

The red light is intended to facilitate the psychic recollection of the subject, and to promote, either spontaneously or with the aid of appropriate suggestive stimuli, vivid psychosensorial activity. From the moment in which thesubject enters into a state of reverie, generally with his eyes closed or half closed (except the case of the painter who made a drawing of a room under the white light) and has rather intense visions, or evokes persons and events which were of emotional significance to him, or sleeps and dreams, hallucinates or is dominated by spontaneous hallucinations, the experimenters do not intervene psychologically, but simply watch the mimicry and poses of the subject; the experimenter wearing the earphones listens for acoustic reactions consisting of typical successive dry noises or of rushing water, or sometimes even modulated sounds of musical notes.

We recommend to the subject at the beginning of the experiment that he keep from moving as much as possible, and that he not worry about relating the theme of his thoughts and visions at the moment when he perceives them, but only if an event of special psychic interest takes place.

This experimental technique was suggested to me by the repeated notice of one fact: when the state of sensory charge, with its accompanying emo-affective tension, is discharged through motor, vascular or glandular expression (passionate reactions, flushed face, tears cries) in particularly emotional subjects, the phenomenon stops abruptly.

I shall wait until later to discuss this fact interpretively, adequately and usefully.

Let it suffice for now to observe that the relation between the de-

gree of cerebral tension (with its corresponding emo-affective potential) with its accompanying psychosensory supercharge, and the radiating electromagnetic phenomena supplies a reason for the difference in strength in the electromagnetic radiations produced by different psychic phenomena.

In order to recognize the place on the film which corresponds to psychosensory phenomena, or to the psychic state of the subject, I used two methods of marking the film; spaces where no light at all is exposed to the film at appropriate moments during the course of the experiment, and light-dots on the perforated margin of the film. With notes taken during the experiment on the psychic manifestations and on the neuropsychic reactions of the subject, and the marks on the film, it is easy for me to read the film afterwards, and to see its relation to the psychic phenomena presented by the subject.

OSCILLOGRAMS WHICH SHOW ELECTROMAGNETIC PHENOMENA RADIATING FROM THE BRAIN DURING INTENSE PSYCHOSENSORIAL ACTIVITY

I shall only include a few films for demonstration, along with a brief explanation illustrating their relation to psychosensory phenomena.

I shall reserve the reproduction and the illustration of another series of films covering about one hundred experiments for another paper because it is worthwhile fixing our attention on some characteristics of the oscillogram.

While I have shown here some films which demonstrate the positivity of my experimental results, I must add that there were many negative, that is, blank films, because of the absence of particular psychosensory phenomena, because of their extreme weakness, because the subjects proved to be inert, or because of the transitory inertia of active subjects.

After trying many different types of film, I settled upon a negative cine-perforated type from the Tensi company in Milan, because of the relation of the photographic speed to the film transport speed.

The reel is ten meters long, so that the filmsvary according to the length of the experiment from a few meters to a maximum of ten.

The film transport speed is about eight centimeters per minute, thus one centimeter of film is exposed in about 7 and one half seconds.

I have said that whether the state of reverie, dream, imaginative creativity or hallucination is begun spontaneously or by suggestive action, the subject is left to himself undisturbed until these psychic conditions end and he returns to his habitual waking state.

Another method consists in persuading the subject to close his eyes and to abandon himself to the greatest possible tranquility, almost to mental inertia (what is meant by this state is of course relative) that is, we encourage him to put himself into the passive state in other words.

This psychic condition is abruptly interrupted by the experimenter, who asks the subject to think about persons or facts which were emotionally significant to him, thus provoking an impromptu reaction which is almost always a mnemonic outcrop.

When a particularly sensitive subject is used in an experiment, and by this I mean a subject gifted with lively sensoriality, after a moment which seems to correspond to an accumulation of psychosensory charge, the complex oscillator is abruptly influenced which is the effect signaled by O.VIII of electromagnetic phenomena radiating from the subject. The reaction is of greater or lesser degree according to the subject, and its intensity varies according to the psychosensory conditions observed. I shall show some films of this phenomenon which I propose to call the psycho-radiant reflex, and I shall speak more

fully about it in my next paper.

This is a phenomenon analogous to the psycho-galvanic phenomenon. But while this latter involves an indirect psychoelectric reaction, since it is manifest – sine qua non – through an intermediary intervention of the glandular and vascular elements of the skin (and can be reduced, for the benefit of those who insist upon an extremely physical explanation, to a lowering of the electrical resistance of the skin of the palm of the hand to the passage of a current), while the psycho-radiant reflex involves a simple and direct phenomenon of cerebro-psychic electromagnetic reaction, that is a true and proper psycho-biophysical reflex.

Its methodical employment in psycho-physiology and neuro-psychiatry will, I hope, offer a practical means for elucidating some of the psychosensorial activity of subjects of which we would like to learn the type, the validity, the rapidity; I hope also that by this it will constitute a tool of some value to psycho-biophysics.

My present research has, among others, two particular objectives with reference to the psycho-radiant reflex: one in relation to its frequency in psychically normal subjects as well as abnormal and paranormal; the other is the particular reaction to intense sensory excitation, not psychic but physical such as a sudden intense light, a sudden intense noise, etc.

We are trying then to ascertain whether or no there is a strictly physical reflex of the sensory brain.

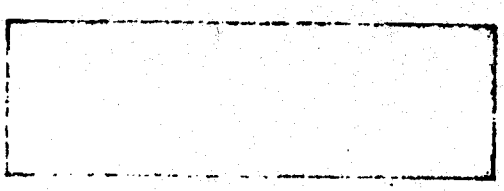
Before showing some radiopsychocerebral oscillograms, or to be more concise, radiocerebropsychograms demonstrative of electromagnetic phenomena of the human brain in lively psychosensorial activity, I should warn that the restrictions of typographical reproduction obliged me to use small sections of film of about 11 centimeters; of course the

reactive psychosensorial correlation is visible.

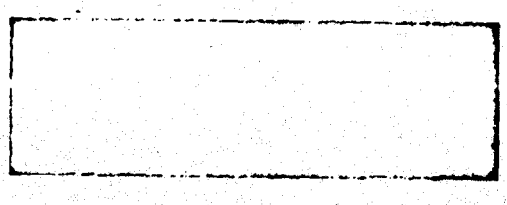
But I am obliged to warn that in order for some of these films to be useful, their entire reading is necessary, that is from one or more meters up to 10 (and the cinematographic reproduction is also possible) this being the maximum length of the film, which is used quite compactly.

This complete reading is especially indicated if one is to observe the inception, the birth, development with related variations and the dying out of the psychosensorial phenomena which the subject presents in the course of an entire experiment.

Such a detailed examination makes it possible to observe some interesting aspects of the psychosensorial and electro-magnetic dynamism of the human brain in certain cases.

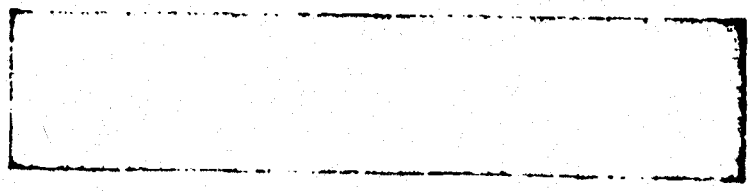


A – Section of a 10 meter film which shows the line as it appears when the apparatus is in function; it corresponds to a negative experiment because of the absence of lively psycho-sensorial phenomena in a subject in momentary psychic inactivity. (D.L.G.).

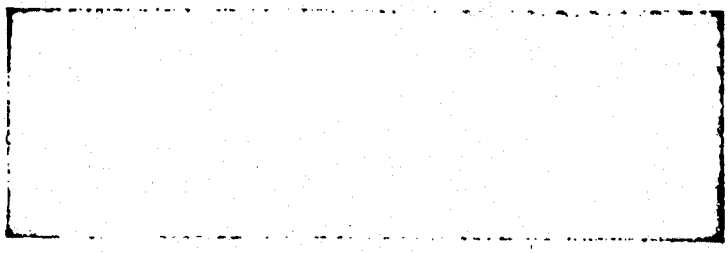


C – Section of a film which corresponds to a picture of a mountain being drawn with conté crayon on this cardboard. The painter, Luigi Binaghi was not thinking of the picture while drawing, but visually evoked the panorama which he had seen from the Great Stone of Italy. To evaluate this film, one must calculate the discharge of energy along the sensory and motor nerves, etc., as the painter draws, that is as he sees in fantasy, in relation to the oscillographic line.

G – Section of a film where we interrupted a passive psychic state abruptly by asking the subject to think about a person who was emotionally of major significance to him; (F.M.) was a subject with an artistic temperament, sentimental, oneiric. Also example of the psycho-radiant reflex.



I – Section of a film which corresponds to a reaction provoked in a water-well diviner, the well known and proven diviner, Chiabrera Stefano when we interrupted a passive state with the injunction: "look for water."
As one can see, a clear psycho-radiant reflex was produced.



N – Section of a film which corresponds to a state of oneiric trance in the sensitive medium, subject (C.S.). During this period the subject cried out in anguish, and awoke spontaneously from a terrifying nightmare consisting of the death scene of a terrorized mad woman. The psychic phenomenon proved to be in strict correlation with the physical phenomenon of radiation.

CONSIDERATIONS AND PRELIMINARY CONCLUSIONS

Some remarks about the oscillographic tracings are necessary. The form of the oscillogram depends above all on the abruptness and intensity of the initial impulses which reach the vibrating cord of the complex oscillator O.VIII whose own equilibrium has been disturbed by the action of electromagnetic phenomena radiating from the brain in

intense psychosensorial activity.

The vibrations recorded are isolated, paired or in series spaced close together or some distance apart, according to the case.

There is certainly a relation between the amplitude of the line and the intensity of the radiant cerebropsychic phenomenon, if we take the tension on the vibrating cord into account as well as the state of stabilized sensitivity of O.VIII.

The form of the oscillogram is also a function of certain qualitative characteristics of the oscillatory reaction; the reaction to a particular psychosensory phenomenon occurring during an experiment may be abrupt or gradual, single or repeated.

The relative inertia of the galvanometer with a vibrating cord cannot be denied, though it is certainly less than the inertia of the moving-coil galvanometer that we had used at first.

In order to make the response of the oscillograph to the variations of the complex oscillator more immediate, I ran a series of experiments using a cathode ray oscillograph.

The instantaneous course of the nervous cortical process (because of its electromagnetic nature) is reconducted by the intracerebral psychic arc; the velocity of that special nervous conduction is close to the velocity of light, simple electrons being involved in both cases.

The question of whether the source of electromagnetic phenomena radiating from the human subject in strict correlation to intense psychosensorial activity should be attributed to the brain or to other viscera or organic systems, is a question which I have already discussed elsewhere, and to which I shall not return.

Through logical elmination of the essential or principal intervention of the other organs (without denying, naturally, the harmonious

visceral response to cerebro-psychic activity, especially psychosensory, nor the discharge along neuro-vascular, neuro-muscular and neuroglandular lines which we cannot fail to notice) the physical source of electromagnetic phenomena recorded, must without doubt, in my opinion, be recognized as coming from the brain.

Let me mention again here the observation which I have already pointed out of the extinguishing of the radiant cerebro-psychic activity during the course of hallucinatory phenomena in which the emotional life of the subject was intensely involved, when the degree of intracerebral tension falls abruptly, discharging through movement and the glands.

The existence of a cause and effect relationship between the psychosensory cerebral centers (with their related circuits consisting of large associative bands joined together, with the frontal lobe and all the other parts of the brain cover, without counting the subcortical projections) and the radiant electromagnetic phenomena, especially when this activity is particularly intense, is thus confirmed in another way.

There is no doubt about the sensory zone of the brain, nor that this zone and some of its parts in particular, serves as an anatomical-functional basis for psychosensorial phenomenology.

I should mention here that according to De Sanctis, one could say that dreams develop from the cerebral cortex and principally "from the convex surface of the two occipital lobes in the location of mental visions, when we consider that 80 per cent of dream images are visual." The same author, observing that one cannot think about hallucinations without having the sensitive and sensory cortical map in mind, asserted that "the cortico-sensory moment of hallucination is unassailable."

Regarding dreams, Leonardo limited himself to very precise phen-

omenological descriptions, indulging inthe superstitious fantasy of his times. Thus, for example, he stated that the eye often saw things as more "certain" (more real) than it did during wakeful imagination; this gives evidence to the lively and hallucinatory sensory character of the oneiric phenomenon. It is only fair to mention that S. Tomaso had already described the analogy between dreams and hallucinations very well.

Cerebral electromagnetic acitivty then helps to explain the reason for the remarkable volume of nervous elements and the immense number of cortical cells (more than 5 and one-half billion; according to Economo's calculation, as many as 14 billion) evidently a psychological requirement for the receiving and storing of many electrons, according to the physical law that the electrical capacity is proportional to the quantity of material decomposed.

G. Epifanio noticed the occurrence of physical phenomena in biological action, the potentials of excitation present in living matter being the same as those which generate action currents.

With all due respect for the knowledge of the fine cerebral structure, we cannot gainsay Loeb's profound statement, aimed at the theorizers of symbolistic histology, that to wish to account for the mechanism of associative memory by the histological or morphological method, is like wishing to explain the dynamics of electric phenomena by the microscopic study of the cross sections of a telegraph wire, or by the enumeration and topography of the telephonic connections of a large city.

Now since it is certain that the anatomical-functional substratum of psycho-sensory phenomena is the brain, and since the electromagnetic phenomena signaled by O.VIII are in strict correlation with the psycho-sensory phenomena presented by the subjects, we are justified in speaking about vibrations or radiations of the brain.

What physical concepts can we formulate from these cerebral radiations? I have elsewhere expressed the opinion that one should prudently consider cerebral radiations as part of a series of different types of electromagnetic oscillations radiating from the brain under certain conditions and in relation to the effects to be obtained. The theoretic admission that radiations are emitted by functioning nerve centers has, as we know, led to two opposing concepts.

The first is that cerebral radiations must be considered to be of the highest frequency, and consequently infinitely short, (less than one millionth of a millimeter). This is a presumption a priori, stemming frequently from the initiatives of the biological theoreticians.

The second comes from Lasareff, who studied the action periods of nerve centers, and arrived at a presumed evaluation of 3000 kilometers as the wavelength of the electromagnetic oscillations emitted by functioning nerve centers.

Now, the results of my experiments do not coincide with either of these opposite afore-mentioned theoretical concepts.

The cerebro-psychic electromagnetic phenomena which I recorded are detectable by the complex oscillator O.VIII, regulated, as I have said for λ equal to about one meter, corresponding to a frequency of 300,000 kilocycles.

This experimentally determined fact allows us to formulate a few hypotheses about the specific quality of the recorded cerebropsychic electromagnetic phenomena.

First of all I must repeat here the fundamental observation that the charge on the cerebral zone, employed in psychic sensory activity, as I have said, along the large association bands, can confer upon them the characteristic of radiating conductors.

According to a first hypothesis then (damped) electromagnetic oscillations of a transitory character could be generated by the brain. We would be dealing in that case with impulses, so that the oscillator could function for frequencies notably different from that for which it is tuned.

I must mention that Ch. Henry, to provide a foundation in theory for biological radiation, supposed the atom of life to be discontinuous, like the material atom and like the atom of energy (electromagnetic) and he used the quantum theory for the emission of psychic energy in packets, in trains of damped waves, in discrete units (quanta).

From a second hypothesis, one could assume that the brain emitted a permanent oscillation of a definite λ, but with variable amplitude. The continual variations in amplitude would influence apparatus O.VIII when they entered into the acoustic range, for which the low frequency amplifier was constructed.

One can argue in a third hypothesis, that the brain radiates oscillations of variable λ, and that when this λ coincides with the fundamental frequency of the oscillator, the signal is received.

A fourth hypothesis refers to the possible coexistence of both of the afore-mentioned conditions, that is of possible variations in frequency and also of possible variations in amplitude. This is the case which seems most likely.

There is finally a fifth possibility: that the cerebro-psychic electromagnetic oscillations are of multiple frequencies and therefore in harmony with the fundamental frequency of the oscillator. In that case, their λ would be less than that of O.VIII and therefore in the range of quasi optic waves (less than a meter).

The last hypothesis is that thelocal cerebral oscillation could be considered as a carrier wave for other radiowaves. This carrier wave

would be a constant vibration X, electromagnetic or other, and would serve as a support for electromagnetic oscillations with any λ.

Naturally, this latter could be identified with the electromagnetic phenomena revealed by O.VIII in correlation to the particular indicated cerebro-psychic activity; that is, these oscillations would still have the brain as their source.

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[Footnotes]

63 Doctor Branly who was not only the illustrious scholar whose name is inseparable from the wireless telegraph, but who was also a doctor of mental diseases of rare wisdom, in a penetrating note which appeared on the 28 December 1897 in the Comptes Rendus de l'Academie des Sciences, reported the similarities of propagation of the nervous wave to the electric wave, and analogoies of structure between discontinuous conductors, such as the coherer and neurons and nerve endings. Such comparisons cause one to reflect. They cause us to wonder if psychic radiations could not be explained by assuming that human thought emits radiations in waves similar to the wireless telegraph or radio. (see Revue Metapsychique [Review of Metapsychics]).

A CEREBROPSYCHIC PHENOMENON OF RADIATION (CEREBRO-PSYCHO-RADIANT REFLEX) AS A MEANS OF PSYCHO-PHYSICAL EXPLORATION

SECOND EXPERIMENTAL PHASE FROM 1933 to 1940

A triode oscillator complex, constructed on Hartly's model and tuned for wavelengths of about one meter (frequency of 300,000 kilocycles) is placed in a small sheet iron room, actually a Faraday cage.

The oscillator, amplifier and mixer are connected together into a stable unit whose metallic cover functions as a total shield, in which the plate and grid storage battery is located. A recorder consisting of an oscillograph with a vibrating cord with provision for photographic recording on film is joined to the oscillator complex; this oscillograph is arranged in a dark room joined to one of the external lateral walls of the shielded cage by a wooden frame: see figures Nos. 12, 13 and 14.

The oscillator described can be seen in Fig. 15 and is called O.IX, the ninth in the series.

It was in the course of over one hundred experiments demonstrating the radiation of electromagnetic phenomena by the human subject in a state of intense psychosensory excitement, that I noticed a particular psychobiophysical reaction to the sudden disturbance of the subject's state of calm by thoughts of facts, things and persons whose recall was accompanied by a strong emo-affective feeling.

I therefore concentrated my attention on this phenomenon. The experiment was performed thus. The subject is seated on the divan with his eyes closed; then he must put himself into a state of psychic indifference, that is into the passive state.

The room is illuminated with red light. The oscillator is already tuned to a good, stable static; then the film is started from the control table. After a few minutes, the passive state of the subject is interrupted by the experimenter asking him abruptly and without warning to think about persons or facts which were of major emotional significance to him, thus provoking a sudden and intense psychosensory reaction,

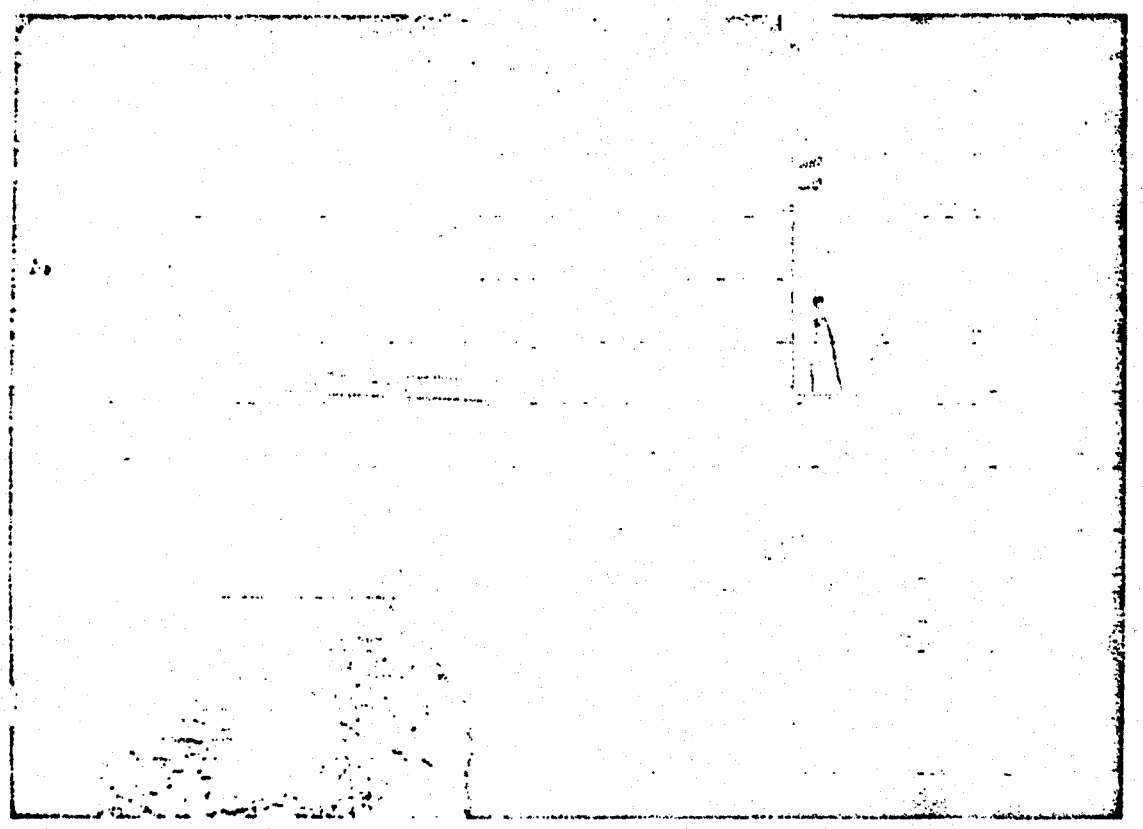


Fig. 15. Interior of the shielded cage. A) Oscillator complex O.IX enclosed in a sealed metal box which also contains the grid and plate storage battery. B) receiving antenna; C) earphones; D) switch for connecting the oscillograph with vibrating cord; E) switch for providing the oscillograph with a magnetic field; F) switch for the light beam of the oscillograph; G) switch for marking the film with luminous dots; H) switch for starting and stopping the film; I) storage battery for the filament; L) storage battery for the luminous dots with which the film is marked.

particulary visual, augmented by mnemonic recall. If the subject is well adapted, and if the indicated psychological conditions of experiment are created, after a short time which seems to correspond to an

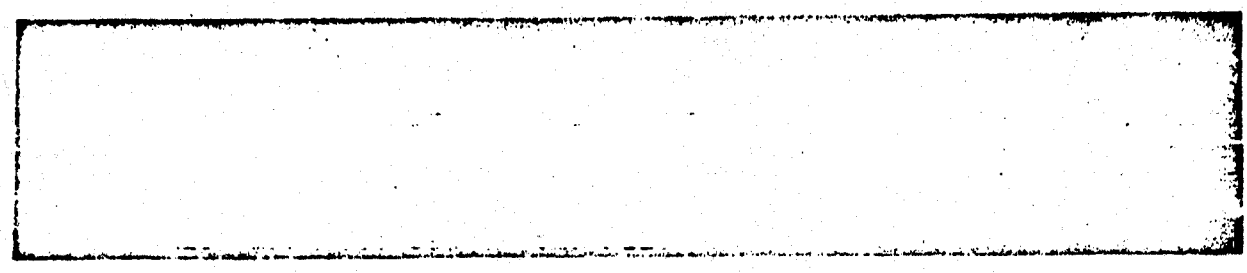
accumulation of psychosensory charge, there is abrupt influencing of the oscillator complex. The reaction signaled by the oscillator is perceived on the earphones as a typical dry sound, either isolated or recurrent, while the oscillograph receives the transmitted variations which are recorded on the film.

Some sections of film demonstrative of the reaction are presented on the following pages (in the cinematographic projection, the respective films are examined in their entirety).

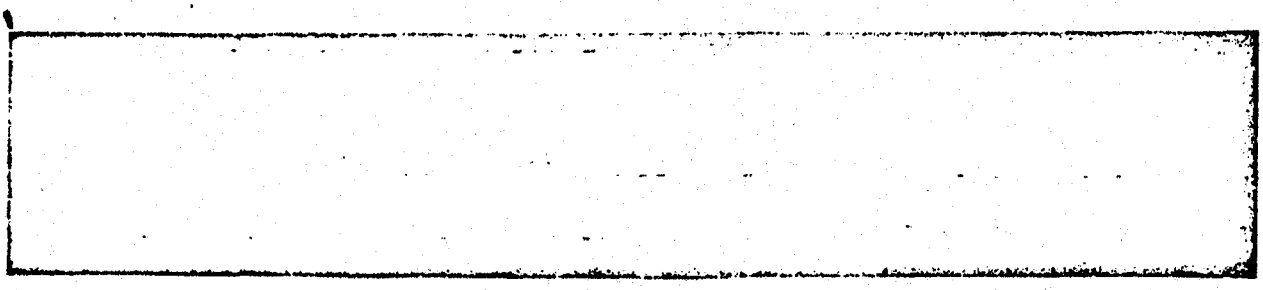
The reaction varies in degree according to the subject and according to the different intensitites of the psychosensory and emo-affective reactions. The form of the film-graph depends upon the abruptness and intensity of the initial impulse, on the degree of tension in the cord, on the degree of stabilization of the oscillator, on the transport speed of the film, which with the described mechanism, revolves in clockwise direction at the rate of one centimeter in about 7 seconds] but now with the use of an electric induction motor, revolves at one centimeter per second .

The reaction reminds one immediately of the psychogalvanic phenomenon. But whereas this latter involves an indirect psychoelectric reaction which can be reduced for those who insist upon a rigidly physical interpretation, to a lowering of the opposing electrical resistance of the skin of the palm of the hand to the passage of current, the electromagnetic reaction described involves a pure and direct phenomenon which can be called the "cerebro-psycho-radiant reflex" analogous to the psycho-galvanic reflex.

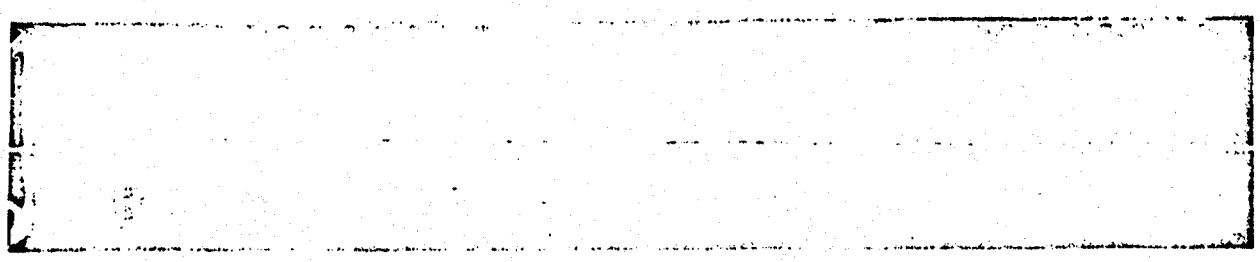
We are in the presence of a psychic stimulus, of a stimulated neural encephalic mass, and of its psychic response, in relation to which a bio-physical electromagnetic phenomenon is manifested.



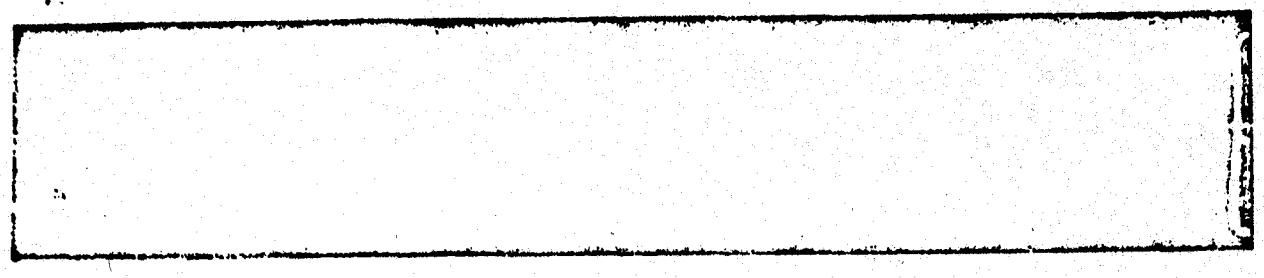
S.A.) Subject who succumbs easily to reverie, to oneirism, to visual plastic recall of events and persons. The passive state was interrupted when the subject was asked to think about a recent, familiar painful scene. In this section we see the positive reaction.



N.C.) State of mental inertia in an emoti e, hyperthyroid subject, interrupted when the subject was asked to think of her little children, forcibly separated from her.



B.L.) Painter. Sensory-visual type par excellence. Alpinist, he participated in the Andes climb with the Italian expedition. Passive state interrupted when the subject was asked to recall the ascent of the Tronador [Thunderer] and the dramatic search for the bodies of the Alpinists who had perished there.



B.A.) Psychoasthenic railwayman of apprehensive and emotive temperament. The state of mental inertia was interrupted when the subject was asked to think about persons who disturbed him emotionally.

M.G.) Auto and hetero-hallucinatory, sensitive subject. The state of psychic inertia was interrupted by a vision suggested by the burning of the subject's own house.

APPARATUS O.X.

The experimental research in psychobiophysics which I have pursued for many years with ever greater refinement of the experimental instruments was aimed at the exploration of some manifestations of human psychism, by observing them in action; this research led me to the discovery of electromagnetic phenomena radiating from the brain in relation to particular cerebro-psychic functional conditions, and more precisely, to the state of intense psychosensory activity; these phenomena provide a new method for experimental research in normal, pathological and paranormal psychobiophysics.

Seeking independence from varied theoretic concepts, I placed myself from a strictly experimental point of view, and tried to see whether in determined conditions of psychic activity (psychosensory) the cerebral zones functioning harmoniously, could exhibit parti-

cular radiant effects. This capital point of my research in cerebral psycho-biophysics will receive adequate illustration in the chapter on general considerations.

The complexes followed one on the other from I. to IX. with a wise utilization of all the latest improvements of radioelectric technique, now in full development, and with the progressive elimination of disturbing factors and of imperfections of function, I succeeded with O.V. and even more with O.VIII and O.IX in obtaining optimum stabilization.

I have made allusion to these former experimental methods because I intend to show that this third series of experiments rests on a new radioelectric apparatus, quite different from the preceding types, and constituting a noteworthy progress in the revelation of electromagnetic phenomena radiating from the human brain.

In order to extend my research to fields of waves other than those referred to in the preceding pages, I had a receiver complex constructed for waves between 60 centimeters and one meter. This receiver uses a "pronged" tube, which is the best suited to Barkhausen's system of a strongly positive grid and negative plate. The oscillatory circuit consists of a quarter-wave dipole inserted into the grid circuit. In the grid circuit is the low frequency coupling transformer for the follower tube, whose function is to amplify the low frequency, in whose plate circuit are the monitor's earphones and the oscillographic apparatus. measuring instrument and a filament rheostat permit us to obtain the best operating conditions. The set is fed by storage batteries and dry cells.

This receiver, used like the earlier long-wave apparatus, i.e., simply as a device for signaling electromagnetic disturbances produced by the subject placed under examination, did not give strictly positive results. The cause of this may be two-fold:

1) the insufficient sensitivity of the receiver complex;

2) the very slight radiation, in the range of waves under scrutiny, generated by the subject.

However, one cannot say that the second cause can be confirmed if the first has not been well verified. The difficulty of easily obtaining sufficiently sensitive receiving complexes (I am speaking about those constructed in 1935-36), led me to try a new principle, that of joining the receiving complex already described to a generator capable of emitting oscillations of the same wavelength as those received by the receiver.

In this way, the receiving complex can be made more sensitive because the signaling tube, functioning as a diode in particular and critical circumstances, in the presence of a permanent oscillation of given amplitude, can more sensitively detect signal oscillations of the same frequency or of frequencies very close to it, which is not true when this permanent oscillation is absent.

The generator complex also utilizes a "pronged" tube, functioning with a positive grid according to Barkhausen's circuit. A system of Lecher wires is connected directly to the grid and plate which allows easy tuning of the complex generator and the receiver. (Figs. 16, 17, 18, 19).

An open 45-mm-wide copper plate, insulated by a rubber sheath and forming a capacitor, is wrapped around the subject's head from the occipital to the frontal region and loosely coupled to the receiving antenna (Fig. 20).

An oscillation or disturbance coming from the subject, reaches the receiving antenna. This receiving complex, driven by oscillations produced by the generator, will reveal variations of received oscillations from the addition or subtraction of the two oscillations pre-

sent, the local oscillator and the one coming from the subject. This latter undoubtedly varies in frequency and amplitude; consequently, the variation in the permanent oscillation in the receiver does not emit definite and constant sounds after the signal, but only rustling or striking sounds.

The experiments performed with this system gave rather precise results, far superior to those obtained up to that time with the preceding arrangements.

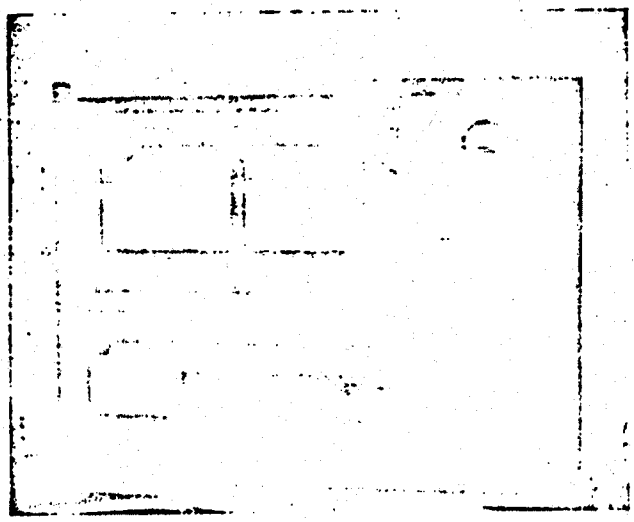


Fig. 16. Generator complex O.X.

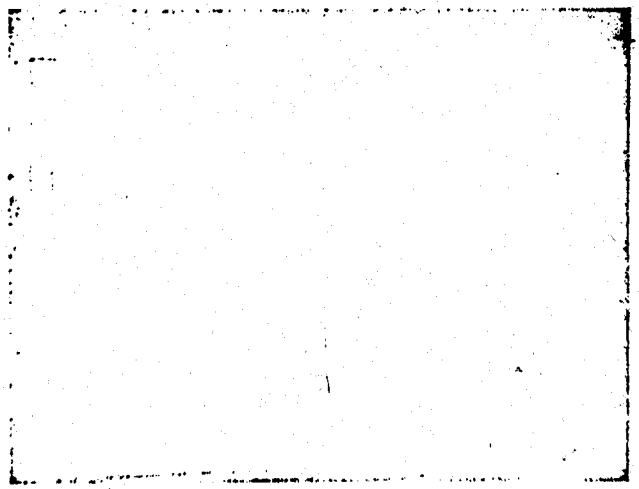


Fig. 17. Generator complex O.X. rear view.

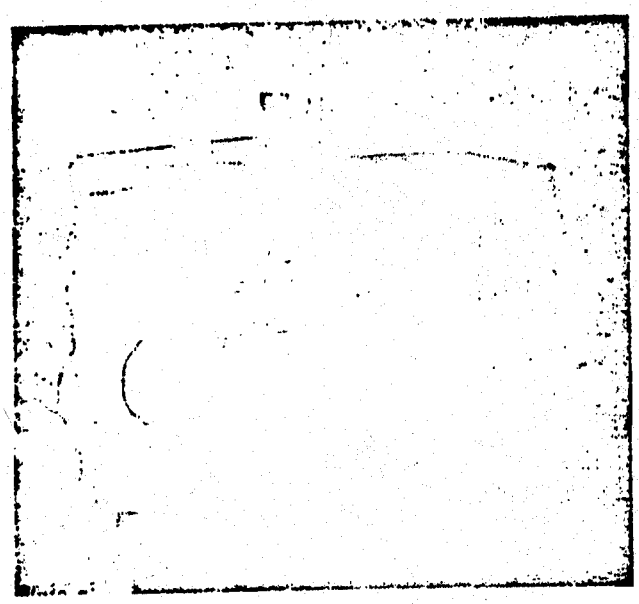


Fig. 18. Receiver complex O.X.

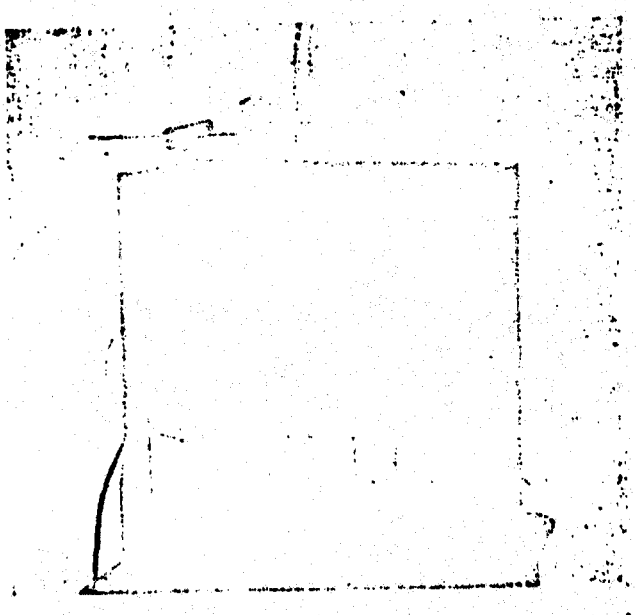


Fig. 19. Receiver complex O.X. rear view.

Moreover, following the recent improvements in electronic tubes and circuits, more sensitive receiving complexes of the superregenerative and superheterodyne type have now been constructed utilizing modern modern tubes.

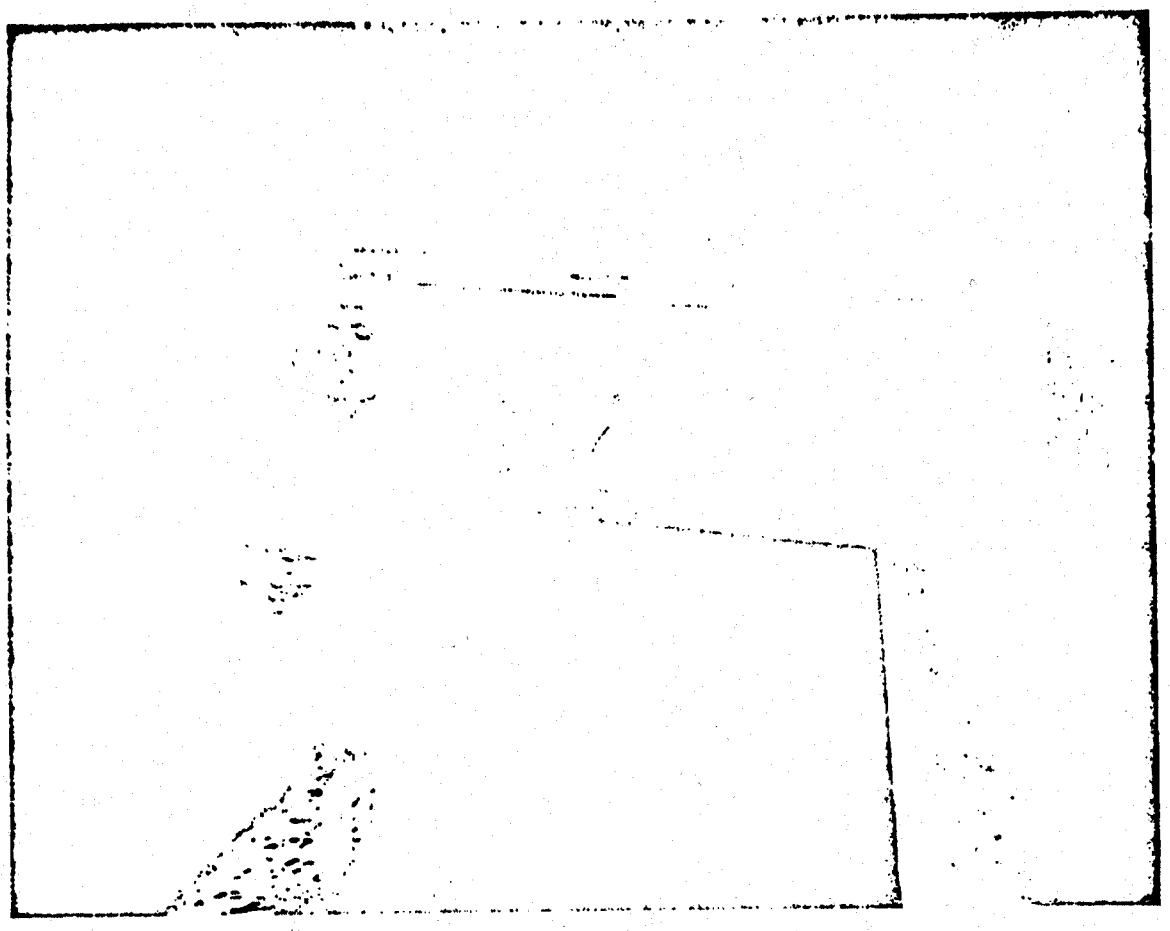


Fig. 20

From one to three experimenters using earphones can follow the phases of the experiment, being able to control both the apparatus and the subject.

The recorder, consisting of an oscillograph with a vibrating cord for photographic recording on film is connected as usual to the short wave complex; this recorder is placed in the dark room which adjoins the shielded cage.

The film transport speed, which in preceding experiments, performed with oscillators O.VIII and O.IX, was about one centimeter per second, is now slightly increased. This is an improved graph; it is precisely one centimeter [illegible] of a second.

TECHNIQUES AND EXPERIMENTAL METHODS

When the two receiving and generating complexes have been tuned and adjusted, the experimental subject is introduced into the shielded cage and installs himself on the little divan, as we have said; then the metal band, which is loosely coupled to the receiving antenna by means of a plate, forming a condenser is applied to the subject's head.

Normal subjects chosen among those exhibiting lively psychic sensoriality (subjects who typically succumb to oneirism) are asked to abandon themselves to a dreamy state or to sleep. In these subjects, as is known, sleep and half-wakefulness are usually preceded or immediately accompanied by hallucinations. Or these subjects are asked to abandon themselves with their eyes closed, to the greatest possible quiet and psychic inactivity, in order to reach the condition called the passive psychic state. This state is then abruptly interrupted with a psychosensory stimulus of excitation or recall of facts or persons who were of profound emo-affective significance to the subject.

I use this experimental method when I want to produce the effect or psychophysical reflex which I have called the cerebropsychoradiant reflex, consisting, as I have described, in an abrupt influencing of the complex oscillator by electromagnetic phenomena radiating from the subject's brain; it is precisely this reaction to a suitable and unforeseen psychic stimulus which produces a state of psychosensory excitation in the subject.

One must be careful to measure the time which elapses between the sensory stimulus and the radiating electromagnetic cerebral reaction to the thousandth of a second on the chronoscope, so that one can say the detection-recording of the cerebral, reaction of electromagnetic radiation is immediate in time, since only simple electrons are involved in brain as well as in the oscillator-receiver.

It has been said that psychic action has a duration which can be measured, since it requires a certain time to be completed, and the more complicated it is, the longer the time required. The reaction time is computed from the interval of time which elapses between the moment in which the stimulus begins to act and the moment in which the subject signals that he has perceived the stimulus. Now, it has been observed that the manner in which the subject signals that he has perceived the stimulus, involves a response via the sense and motor organs; this is not the reaction time of psychic action only, but of psychic action plus the centripetal transmission time (sense organ – sensory cortex) plus the centrifugal transmission time (motor cortex – neuromuscular endings).

It is only through this research in radiant psychobiophysics that we can proceed to the physical substratum of psychic action and that we can state that it is simple electrons which are involved. Whence the immediacy and the velocity close to that of light.

Pathological subjects, especially those whose visual hallucinations are prevalent, are left to themselves with the suggestion that they close their eyes so that the attenuation or the exclusion of environmental sensory stimuli will promote hallucinatory effervescence.

For the paranormal subjects, by which I mean the so-called sensitive subjects, that is cryptesthetics, telepaths, hypnotized subjects, water-well diviners and graphologists, the experimental procedure is adapted to the particular necessities of the psychic and metapsychic phenomena to be explored. After pragmatic experiments to determine their specific sensitivity of faculty have been done, all these subjects are systematically asked to close their eyes and to abandon themselves to fantasy, to dream states, psychosensory conditions which are almost habitual in such subjects, and characteristic of their telepsy-

chism.

From the moment in which the subject enters into a dream or phantasizing state with rather intense visions, his eyes closed, (except in the case of the painter when he redrew a picture in white light) or when he evokes persons or events which were of major emotional significance to him, with plastic vivacity, or in a half-wakeful state succumbs to hypnotic hallucinations, or has vivid dreams while sleeping, or has hallucinations, either spontaneous or provoked, or enters into a state of slight trance such as do the sensitive subjects, the experimenters then cease all psychological intervention, and simply stand by to observe and to await the mimicking expressions and poses of the subject, and the eventual acoustic reactions on the earphones consisting in the positive cases of rustling or isolated knocks, successive knocks or hissing.

I shall mention here once again that once the experiment is begun, we ask the subjects to keep as still as possible, and not to worry about letting us know about the theme of the visions either as they happen or immediately afterward, but only to let us know only when a special psychic condition has subsided and they have returned to the wakeful state.

This experimental detail was suggested to me by repeatedly noticing one fact: that is that when the state of sensory charge with its accompanying emo-affective tension, is discharged through motor, vascular and glandular expresssion (passionate reactions, flushing of the face, cries, wails) in subjects who are particularly emotional, the phenomenon of radiation stops abruptly.

One can project cinematographically a film of ten meters' length, I have said. Since the film can be started, stopped, and skipped [illegible] it easily in relation to the psychic phenomena pre-

sented by the subject. The restrictions of printing require me to limit the reproductions of these films to a few positive graphs, chosen from among the most demonstrative. The radiocerebropsychic oscillogram which reveals electromagnetic phenomena radiating from the brain during intense psychosensorial activity, I have called, I repeat, a cerebro-psychic radiogram, or in a single word: radio-cerebro-psychogram. (RCPG).

I must also add that there were numerous negative films, that is blank films, resulting from some experiments in which the absence of the indicated particular psychosensory phenomena predominated, or in which these phenomena were extremely weak; this happens when the subject proves to be absolutely inert, that is lacking in psychosensory liveliness, or during transitory conditions of inertia in subjects who are habitually active, that is who are gifted with intense psychosensoriality.

The human subject is extremely labile from a psychic point of view, particularly in the zones of paranormality and pathology, so that at times, accidental emotive reactions or causal variations in the experimental conditions are enough to inhibit the phenomena momentarily.

In this case the subject does not succeed in entering that psychic state favorable and necessary to the emission of psychosensory phenomena which under ordinary and favorable conditions are manifest in all their splendor.

The film which was begun for hundreds of discriminatory experiments according to a psychological criterion of evaluation, that is, when the subject closed his eyes and abandoned himself to reverie, or to sleep, is now begun with the first positive acoustical reaction on the carphones, by which the entire experiment is followed and con-

trolled, in order to economize on film.

I am referring to the series of experiments completed in these last three years, from February 1937 to May 1940.

The subjects who gave positive results for intense psychosensorial activity were subdivided into three groups: normal, pathological and paranormal.

As usual, brief notes describing the psychic personality of the subject will precede the synthetic illustration of each radiocerebro-psychogram.

It goes without saying that I have taken somatic clinical, neurological and psychological data for each subject whether normal, pathological or paranormal.

Thus thereis a verbal component to each experiment from which the brief explanations of the pscychosensory phenomena are derived, in relation to the detected electromagnetic phenomena radiating from the brain, and of which the radio-cerebro-psychograms are the graphic translation.

I shall not even mention here those numerous subjects, assayed exploratively; they were either normal subjects who were proven to be inert by the absence or extreme weakness of psychosensory phenomena, or false hallucinators who were really exhibiting interpretative delirium, or apparently paranormal subjects who proved in fact to exhibit automatism without cryptesthetic sensitivity.

The sections of film chosen for reproduction must therefore be considered taken out of the context of the complete film of the experiment, exposed in strict correlation to the psychosensory phenomenology of the subject emerging during the experiment itself.

Thus the final considerations, general or particular, which I will discuss after the illustration of the RCPG, refer not so much

to the short sections of film reproduced, as to the entire film from which they are taken, which constitutes the complete, physical effective documentation of each experiment for each single subject.

RADIO-CEREBRO-PSYCHOGRAMS (RCPG) OF NORMAL SUBJECTS GIFTED WITH LIVELY PSYCHOSENSORIALITY (ONEIRICS)

For the purposes of analogy, I shall mention here the psychogalvanic reaction, in which the cause of the deviation of the galvanometer seems to be the dimunition of the electrical resistance of the skin of the palm of the hand to the passage of current. This variation in resistance is in direct relation to the influence exerted by the brain on the peripheral vasomotility through a perception with emo-affective content.

For years, there has been talk of the introduction of the psychogalvanic reaction into criminology – as a means for seeking the truth – applying it to the suspect during the interrogation.

But the enormity of testing a suspect's guilt or innocence by the psychogalvanic reaction should be apparent from a superficial observation. If we consider an innocent suspect of emotive temperament, the guilt for a crime which he did not commit would be attested by the cerebro-vascular emotional involvement which would surely give a positive psychogalvanic reaction. But for the deliquent hardened criminal, when the statement is made of a crime committed, his mastery of his nerves, and his habitual impassivity will in all probability and almost certainly give a negative psychogalvanic reaction.

I must add that while the psychogalvanic reaction is an indirect psychoelectric reaction, the cerebropsychoradiant reflex is a direct psycho-electromagnetic reaction with a relation between the brain and the cosmic ether. But the application of such a test in criminology would be arduous, and no prudent judge would have recourse to these

methods of experimental inquiry, rejected by our profound juridicial experience which must defend itself in the century of mechanics from such similar efforts to violate the human conscience.

Among the particulars of the current experimental phase, is the study of spontaneous sleep from the psychobiophysical point of view, induced with auto- and heterohypnosis, provoked with hypnotizing substances and pathologic sleep. It is hoped that from experiments systematically conducted on normal, paranormal and pathological subjects in the varied conditions of sleep indicated, will come some new clarification of the phenomenon of sleep still under discussion, and of the related biophysical condition of the brain.

P.F. – Male subject, eighteen years old, student, gifted with quick intelligence and with intense psychosensorial vividness (easily succumbing to oneirism).

RCPG. 1 – related to oneiric recall of cinematographic type, of an incident between a cyclist and a street car which had recently occurred, with a vision of the subject himself in the various phases of t e event as in a dream. At the end of the oneiric recall, he was found to be in a true state of dreaming and repeats with automatic movements the disposition of the accident victim.

Subject. N.N., female twenty five years old of delicate temperament, hypersensitive, intuitive, distinctly affective and emotive with lifely spontanecus oneirism habitual in the half-wakeful state.

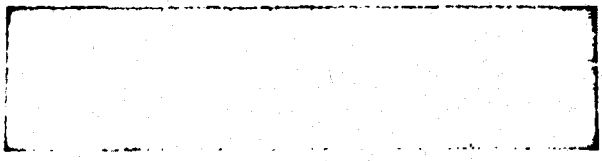
RCPG. 1 – related to a vision of mountain climbers, the subject included, in the neighborhood of a mountain refuge, with identification of the sportsmen, some known, some unknown, and then the return by bus with the spectacle of the young men joking and feigning drunkeness, and particularly one among them who interested the subject particularly. The whole with a cinematographic clarity and rapidity.

RADIO-CEREBRO-PSYCHOGRAMS (RCPG) OF PATHOLOGICAL SUBJECTS

M.V. – Male subject, fourteen years old, affected with rare convulsive attacks of an epileptic nature, typical oneiric temperament.

RCPG. – related to the recall, with closed eyes, of a very lively dream of the preceding night and reviewed in the morning in all its particular movements. Protagonists of the dream, M. and a cousin. The dream was reviewed in all its parts successively with lively psychosensory intensity.

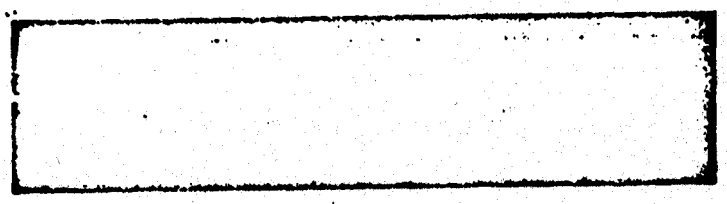
O.M. – Female subject, thirty years old, affected with psychasthenia on a hysterical constitutional background. Hypersensitive temperament, emotive, passionate, oneiric.



RCPG. – related to the subject's being asked to think of her dead husband, to whom she was strongly emotionally attached, with provocation of the cerebropsychoradiant reflex. Very clear vision of recall, as if cinematographic, of the habitual scene when the husband came in through the gate driving the automobile in his quick and dominant manner, and

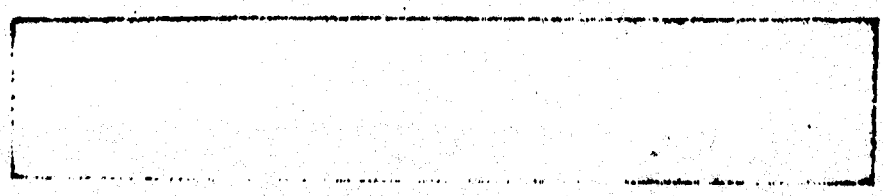
the children running to meet him, and she trembled in fear of the car, still in motion upon which the children climbed.

S.S. — Male subject twenty years old, affected with a confused-depressive attack which was being resolved at that moment, acutely rebellious during his military service.



RCPG — related to the passive state, interrupted by the subject being asked to think about the "witch" that is an old lady who frequented the house and to whom during the most acute phase of thepsychotic attack, the subject attributed the cause of his delirium. It is evident that the unforeseen recall of such a person caused an emo-affective reaction in the subject which power was suggested by the oneiric recall. In fact the subject, after the experiment declared that he had seen clearly the figure of the "witch" as when she was speaking to him or touching him on the shoulder, etc.

G.F. — Male subject, fifty years old, affected by acute alcoholic hallucinatory syndrome. The subject during the acute period and during his cure, fell asleep easily and almost immediately, multiple lively dreams arose, multiple but coordinated, which upon waking were reported with the clarity described. During his convalescence, the subject had a lively oneiric psychosensoriality for many months, which diminished gradually and progressively, when the cure was complete.



RCPG. 1 — related to a dream taking place during sleep and reported when awake. He was in the mountains of Carnia, the world war was raging, and it was snowing heavily. A captain wrapped up in a long cloak commanded the patrol of soldiers with the baggage trains. Two peasant women and one little girl asked to be transported to their house, profiting from the itinerary of the military column. The captain said harshly

"first the baggage and then the people." The column started and reached a tunnel and the Captain ordered "detach the mules and bring them into the tunnel...carry the baggage" and he cried "how will you manage to carry the people? Don't you see that it is snowing and that we must carry this battery...first the baggage...then the people...and the mules safe in the tunnel." This whole scene took place under uninterrupted snow. The oneiric hallucination was intense, very clear and coordinated, and the psychophysical correlation, very strict.

RADIO-CEREBRO-PSYCHOGRAMS (RCPG) OF PARANORMAL SUBJECTS

I have said that the experimental method varies for paranormal subjects (cryptesthetics, telepaths, water-well diviners, palmists, graphologists, etc.) not only hypnotics, according to the particular psychic or metapsychic state to be explored, or to the pragmatic habits, the special individuality of the subject.

In these cases we are exploring the essence, intensity and duration of a particular psychophysiological state, slight trance with its related distinct cerebropsychic sensory activity, together with the phenomena whose nature emerges as incontestably metapsychic.

In the scientific clarification of the problem of water well divining, I was able to draw some conclusions at the end of 1931, which are particularly important for the psychobiophysical exploration of the well divining phenomenon after numerous experimental tests and after observing these diviners at work (20/21). Since the results of these psychobiophysical explorations must be evaluated along with the results from other sensitive subjects, I believe it is useful to resume here those conclusions:

1) First of all, the fact that a mysterious substance under ground strikes the sensitivities of some human subjects and not others, confirms the opinion that one must consider well water divining as a sensitivity or faculty of recognition different from the ordinary faculties which some subjects have been shown to possess, and which is lacking in the majority of subjects.

There is still some confusion today between the common and well known phenomenon of muscular automatism and that of telegnomia (such as the well water diviners). There are a great many automatic subjects, but there are very few sensitive subjects (among them the well diviners).

2) The state of expectant attention which is manifest in all subjects as they prepare for the search, and which they come to understant perfectly in the photographic instant, fully confirms my concept that the psychophysiological state of the diviner in action is conceivable as the state of slight trance.

3) Divining is doubtless a manifestation of human psychism forming part of that group of human faculties of unusual recognition (paranormal).

4) The rod is not necessary for the expression of the divining phenomenon.

It is a means among others such as the pendulum which subjects are free to use or not to use.

Rods of various types, in natural or painted colors, pendula and all the other instruments used by diviners have only a suggestive value, to which one might attach some importance as an aid, for orientation or precision.

5) The particular sensitivity to various substances is different in different subjects, and varies from the gross, massive sensation that there is "something under the ground" to a specific sensation of water, minerals, a particular mineral, etc.

Often the subject uses narrow metallic pieces in his hand, in as far as he seeks qualitatively to define. Undoubtedly, there is an autoindicative, perfecting and refining possibility in such sensitivity.

6) To define the quantity and above all the profundity of water and substances underground, the systems used by different diviners

may vary, but their common basis is an unconscious arithmetical calculation, which is then translated into operations in the state of wakeful consciousness.

7) The esoteric organic reactions observed in the diviners in action varies in intensity according to the subject but they all consist – whether through movements of a rod or a pendulum or with empty hands – in muscular contractions, in slight or severe trembling, in vasomotor disturbances of an emotive nature (such as tachycardia, flushed face, profuse sweating) in oppression or solar anxiousness*(with emotional excitation or immediately anxious) in tactile, thermal, gustatory and visual sensations.

8) These motor, sensitive and sensory reactions evidently demonstrate that various cerebral reflex arcs are involved. One can therefore conclude that stimuli which strike the central nervous apparatus of the subject, are discharged according to the laws of reflexion into nearby or distant psychomotor, psychosensory and somatopsychic arcs; they then fix themselves in the consciousness of the subject, where after the first surprise, they can be discriminated according to the quality, quantity, profundity and location of this mysterious substance underground.

9) To establish the reflexogenic mechanism of the motor, sensitive and sensory reactions – true psychic reflexes of diviners – to define the state of consciousness which characterizes their peculiar activity of the scanning of the underground, to specify whether it be the former or the latter, and as far as possible to fix the anatomic location and the physiological dynamism, is to make one fundamental point certain for the scientific posing of the divining problem, and through it, a serious experimental exploration.

In fact, physiopathology and psycho-biophysics has located psycho-

sensory activity in the brain, after anatomical data. Thus the diviner's psychic reflexes, during the state of slight trance have their central location of confluence, elaboration and activity in the brain.

We are therefore facing a particular and unusual activity of the brain.

10) In order to explore the divining phenomenon, then, we must cause observation to converge with experiment on the fundamental psychic state during which the telegnomic divining faculty is manifest.

We must therefore catch the human brain experimentally in its flagrant moments of exceptional psychobiophysical activity.

I proceeded according to the following plan, methodically followed, in order to explore the diviners' state of slight trance from my own experimental, psychobiophysical point of view.

After the subject is seated on the small divan, and the instruments are perfectly tuned, I asked him to abandon himself to the greatest psychic tranquility possible, as though to a passive state. After a few minutes, I tell the subject to put himself into his habitual psychic state of the searching diviner, using the rod, pendulum or other instruments if he wishes, just as though he were scanning a portion of the ground.

In a second part of the experiment, I warn the subject that I am going to place bottles containing liquids (without telling him their nature) on his legs or on his abdomen; I have marked these bottles with numbers indicating their contents (benzene, water, alcohol, gasoline, wine); then I ask him to divine the contents of these bottles and to tell me his results.

I repeat the same experiment with metals such as lead, iron, copper, gold.

In the third part of the experiment, I observe the subject's psy-

chosensoriality in sleep or in reverie, as I do in normal subjects. Then I interrupt the passive state with the abrupt command, "look for water," etc.

According to the results of the experiment, I examine what I shall call the pragmatic cryptesthesia, either with the bottles of liquid or with the metals, whichever gives the better reaction, and this time I tell the subject the nature of the liquid (the nature of the metal is visible) that he is to examine.

Depending upon the estimated capacity for resistance of the subjects, it is sometimes necessary to give brief rest periods between the different parts of an experimental run, or between one run and another.

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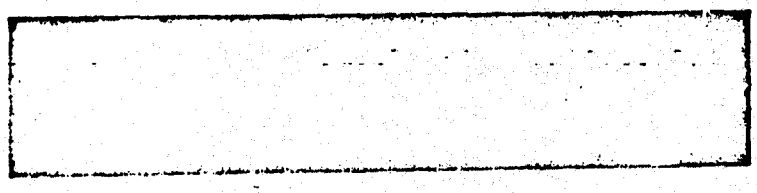
Of sensitive subjects as a whole, I shall say that in the state of slight trance, there is effectively a simultaneous dissociation of the psychic personality, varying in degree according to the individuality of the sensitive subject and according to his type of sensitivity or faculty.

The sensitive subject can fall into autohypnosis (ordinarily with his eyes closed) with alternating personalities, or personalities replacing the normal, or he can remain in a state of apparent normality with automatic writing; diviners will explore the terrain, chiromantists the hand, graphologists will explore handwriting and generic cryptesthetics will explore objects. In these cases, the expert in psychophysiology and neuropsychiatry notes that the subject when he engages in conversation or writes or walks, is in a state that one can call expectant attention. He is cut off as it were from the ordinary environment. He is in a half-dream state such as one might be in during fantasy, artistic creation, scientific or philosophic speculation, with automatism

evident by his actions. We know also that it is quite possible for the sensitive subject to enter, leave, re-enter and again leave that characteristic psychophysiological state which we call slight trance.

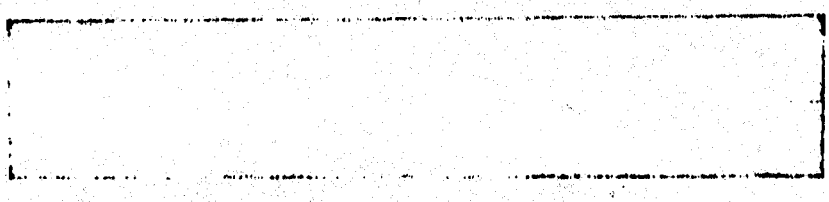
This state is accompanied by neuro-organic, neuro-muscular, neuro-vascular, neuro-psychic reactions which demonstrate the involvement of various cerebro-somatic and cerebro-psychic reflex arcs. It is during this state that factual knowledge is manifest which the ordinary activity of the senses cannot furnish about the outside world.

B.P. Male subject, thirty three years old; occupation, building construction; a diviner, whose divinations had been used successfully for water wells. He uses a pendulum and an auxiliary apparatus which "serves to eliminate the extraneous radiations from those coming from the object specified (water, etc.), whose search he has undertaken."



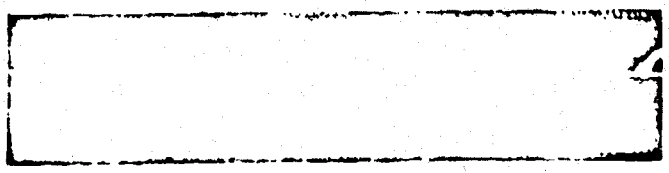
RCPG. 1 — related to the state of slight trance while he searches with the pendulum over the bottle of benzene, without knowing its contents.

C.S. Female subject, forty years old, sensitive, who exhibits automatic writing accompanied by cryptesthetic phenomena both pragmatic and accidental, in the state of slight and deep trance (the subject has a "guide").



RCPG. 1 — related to a hallucinatory scene in trance during which the subject saw herself among world famous personages of antiquity.

C.A. — Male subject, forty-five years old, medium having physical effects, with automatic writing (his dead son is his guide). Blows and the spontaneous lifting of objects have occurred in his presence, according to the testimony of reliable witnesses. The subject had a premonition of the death of his son who was a sailor in China. He does automatic writing, saying that he is inspired by his son; he writes essays on the subject of social and religious reform.

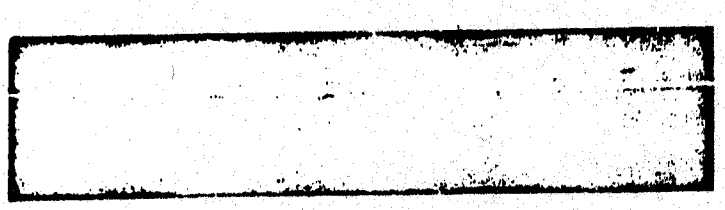


RCPG. — related to a vision of his son in maritime dress, with hallucinatory intensity and with his eyes closed.

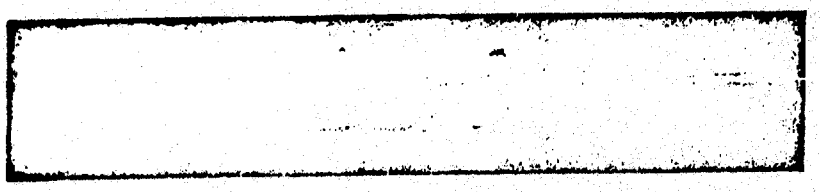
I.C. Female subject, twenty-two years old, musical sensitive medium with automatic writing.

RCPG. 2 — related to pragmatic cryptesthesia, positive, successful.

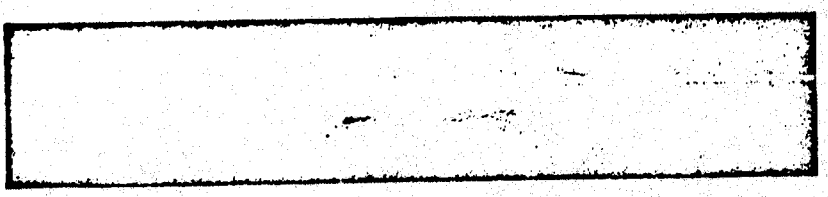
S.C. — Male subject, seventeen years old, sensitive with marked pragmatic cryptesthetic properties (clairvoyance) in the hypnotic state. The interesting experiments done with him in Rome have been amply described. A new series of experiments were later completed in Como in an open field which had been appropriately prepared, with optimum results. This subject was also used in psychobiophysical experiments, but only after he had been hypnotized.



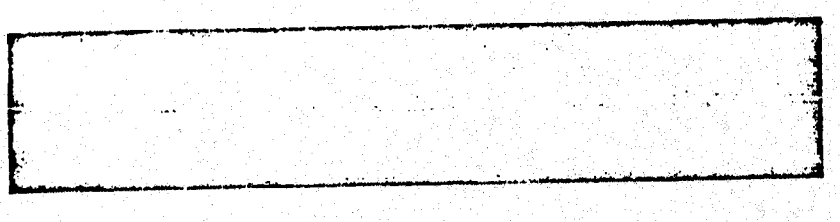
RCPG. 1 — related to a command given to the subject to examine a closed envelope, "look into this envelope: tell me what you see inside."



RCPG. 2 — related to the examination of the contents of a box, which examination we obliged the subject to make.



RCPG. 3 — related to the examination of the contents of a box, which examination we obliged the subject to make.



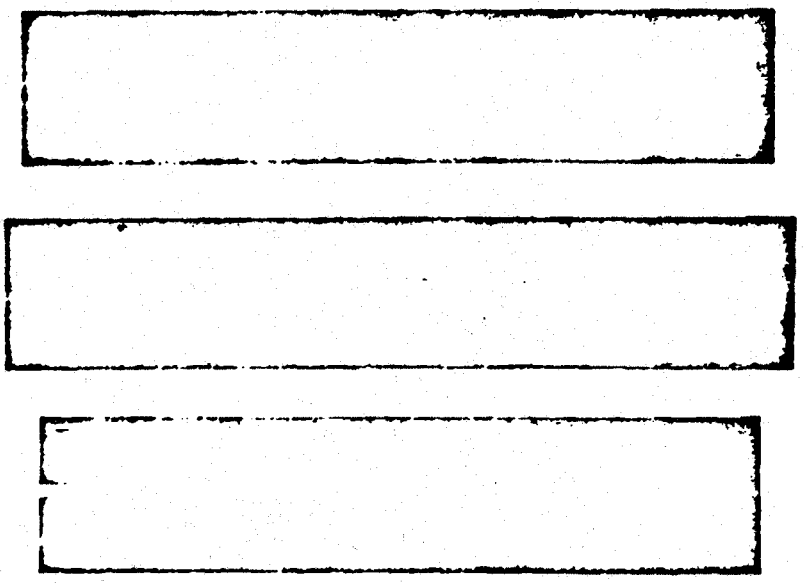
RCPG. 4 — related to the examination which we ordered the subject to make of a closed envelope.

The replies of the subject in the hypnotic state concerning the contents of two envelopes and two boxes were rather good approximate descriptions.

P.F. — Male subject, eighteen years old, student, in the group of normal subjects.

At his request, he was hypnotized. During hypnotic sleep, always under light, but sufficient to cause visual hallucinatory suggestions,

(also in some cases with partial but clear memory lapses following this) we obtained some films from which three sections are reproduced here. I should add that during the experimental runs when autohypnosis with hypnotic pall was employed, there was no reaction of electromagnetic radiation, though the positive reactions filmed were either at the height of the hypnotizing action, or during suggestively induced hallucinatory scenes.



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It is evident that we shall be obliged to pursue more deeply this open question of psychological and perhaps psycho-biophysical order, whether this is hypnosis by fascination, with a long series of experiments systematically performed according to pre-established plan. This is because we are dealing here with seeing if it is possible, among other things, to separate two facts: hypnotic action and induced hallucination. This latter only confirms the now readily accepted fact of the radiation of electromagnetic phenomena related to functional psychosensory excitation of the brain.

But since we have obtained positive reactions in these first experiments, related to the height of the hypnotic action, the question is then reopened as to whether this sort of energy does not emanate from the brain of the hypnotized subject, since we see that he (his brain?) is invested with it. If confirmed, this fact could perhaps be consolidated with the hetero and autosuggestive factors of hypnotism. Thus, I hope that further numerous experiments will allow me to clarify this question in whole or in part.

After the experiments of 1927-32, I sought to obtain a cerebro-radiant effect or reflex, not from a psychic stimulus, but from a physical sense stimulus, for example from a very bright light or from a very loud sound, which would cause a sudden shock to the respective sensory centers. This was an attempt to determine whether a strictly physical reflex from the sensory brain was possible.

My being called into military service interrupted this series of experiments which I had begun in order to set the limits of this question.

* * *

In 1941, there appeared another attempt to criticize the results of my experimental research in psychobiophysics, but this time it was not inspired by objectivity as it had been in 1926, but was suggested by a strong personal resentment. In fact, ten years before, at a meeting of the Italian Society for the Progress of Science, a paper of mine, "Divination – the scientific posing of the problem" was attacked with erroneous physiological propositions. So much so that I inquired about the propositions advanced with such extreme pomposity to Italian physiologists and psychologists as well as to foreign experts of international fame; the replies which I received were decisively contrary to

those advanced in the criticism, and adhered completely to my theses.

The scientists to whom I inquired are Charles Richet, the great physiologist, V. Ducceschi, physiologist of great renown, G.Guiccardi, one of the founders of experimental psychology in Italy, E. Baglioni, the physiologist of the University of Rome, S. De Sanctis the psychologist of the University of Rome and the replies are the following:

Guicciardi: "To your questions (the generic and the specific ones) I reply with a loud Yes, of which you sir may make use as you see fit."

Richet: "Certain effluvia, certain radiations act on the sensitivity of well diviners.

This action on their sensitivity provokes a reflex of a quite special nature; I can compare it to nothing else. The excitation, it seems, acts on bone marrow and the brain causing an involuntary but conscious psychic reflex.

What you shed light quite clearly upon is this: that it is a property of the nervous system; that it varies with individuals."

De Sanctis: "You speak of reflex cerebral arcs. This theory is accepted by everyone, physiologists and physiopathologists; the existence of the psychic reflex has been accepted for a long time already by Bonatelli, Richet and everyone else."

Ducceschi: "I shall reply to your first question that the statement which you make of the divining problem seems to me to comply fully with the requirements of scientific research.

To the question about the existence of cerebral reflex arcs, besides the arguments which you have adopted, other factural data oblige us to reply affirmatively, for example the existence of Pavlov's conditioned reflex."

Baglioni: "diviner who has entered into a state of slight trance, as Prof. Cazzamalli, one of our best scholars, rightly thinks."

We can see then that renowned masters of physiology, experimental psychology, and neuropsychiatry openly support my scientific thesis with the weight of their indisputable and highest authority.

Those opposing this theory because of prejudice, did not cut a very brilliant figure on the occasion of this scientific debate.

There remained a sediment of personal aversion which sought expression first in an attempt at an act of tyranny directed toward me in the university chair, a move which ended miserably with the punishment of its author; and its second expression was an attack on a cultural review journal concerning radiesthesia and divination in 1941.

To the charge that my research has not aroused the interest of the scientific community, I pointed out:

Leonardo Bianchi, Enrico Morselli and Giuseppe D'Abundo, three prominent men in Italian neuropsychiatry, have shown much interest in my research, and to quote only Morselli, here are his words on this subject: "It is a lot to talk about, and even more to perform in this fascinating realm, upon which you have shed new and unexpected light. Thus I would like to see the students of neuropsychiatry become more interested in your research." The great physiologist Charles Richet, gave this opinion: "Innumerable, unknown vibrations! What an immense future. Your attempt to make some of these vibrations known is one of the most audacious and fruitful attempts of modern science." Prof. A. Boutariac of the Faculty of Sciences of Dijon expressed himself thus: "I am glad to know of your excellent research the whole of which constitutes a contribution of the first order to the journal, Savoir [Knowledge] and I should be happy to contribute toward making it known in my country."

My experimental research is described by Prof. Angelo Pugliese in his Trattato di Fisiologia [Treatise on Physiology], published by

Hoepli in 1935, on pages 631 and 632.

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[Footnotes]

184 From the data collected from more than sixty qualified diviners, we see that the psychism of such subjects is most clearly evident in the noonday sunlight.

ELECTROMAGNETIC PHENOMENA RADIATING FROM THE HUMAN BRAIN DURING INTENSE PSYCHOSENSORIAL ACTIVITY IN THE ONEIRIC, HALLUCINATORY AND TELEPSYCHIC STATES

(O-XI New Radio-Electric Super-Regenerative and Super Heterodyne Micro-Wave Apparatus)

Third Experimental Phase from 1941 to 1954

INTRODUCTION

In my publication "O.X. Complesso per onde elettromagnetiche decimetriche o microonde" [Unit O.X. for Electromagnetic Decimeter or Microwaves], I announced that we were beginning to use new, more sensitive, super-regenerative and super-heterodyne units with modern acorn tubes.

O.XI responds well to the recent improvements of electronic tubes and their related circuits.

In order to obtain receiving units which were sensitive enough, we followed the principle, already adopted for unit O.X. of joining to the receiver (Fig. 21) a generator capable of emitting oscillations at the receiver wavelength. The receiver is thus made more sensitive because the signaling tube, functioning as a diode in the presence of a permanent oscillation, reveals the presence of oscillations of the same frequency or of frequencies very close to it, with greater sensitivity than it would in the absence of this permanent oscillation.*

I should mention for the sake of the uninformed, that I have pursued experimental research in psychobiophysics with ever greater refinement of the instruments of inquiry; my aim was to explore some manifestations of human psychism by catching them in flagrant activity; this

research led me to the discovery of electromagnetic phenomena radiating from the human brain in relation to particular functional cerebro-psychic conditions, specifically to states of intense psychosensorial activity (oneirism, hallucination, telepsychism). By oneirism, I mean that peculiar condition favorable to dreams, normal hallucinatory phenomena during sleep and the dream-states of pre-sleep and reverie. By hallucination I mean morbid, especially visual hallucination of psychopaths, and the hallucination induced by certain drugs or by hypnotic suggestion. By telepsychism I mean the whole gamut of phenomena of subjective metapsychics (cryptesthesia, either spontaneous or pragmatic, lucidity, clairvoyance, telepathy, well water divining, radiesthesia, graphognomy, cartomancy, chiromancy).

From the general and theoretical point of view, I shall limit myself to commenting only that my research forms a fundamental part of all that derived from Galvani's formidable discovery of animal electricity; much light remains to be shed on these vital phenomena, and in particular on the phenomena of nervous and cerebral activity.

The ever more numerous and persuasive proofs that nervous energy is not specific but aspecific and of electric and electromagnetic nature, go from the tewitching of the heart according to Galvani, identified later by the Weber brothers as an inhibition by electromagnetic excitation, to Helmholtz's research on the velocity of nerve conduction, to the demonstrations of Nobili, Matteucci, and Du Bois Reymond of electric current in nerve, muscle and tissue in general in the resting, active and changing states, to the study of electric current in the heart (Waller) to the discovery of electric current in the brain (from Horsley, Tschiriew and Nemminsky up to Berger and Adrian).

Stepping aside from various theoretical concepts, I placed myself from a strictly experimental point of view and tried to see whether

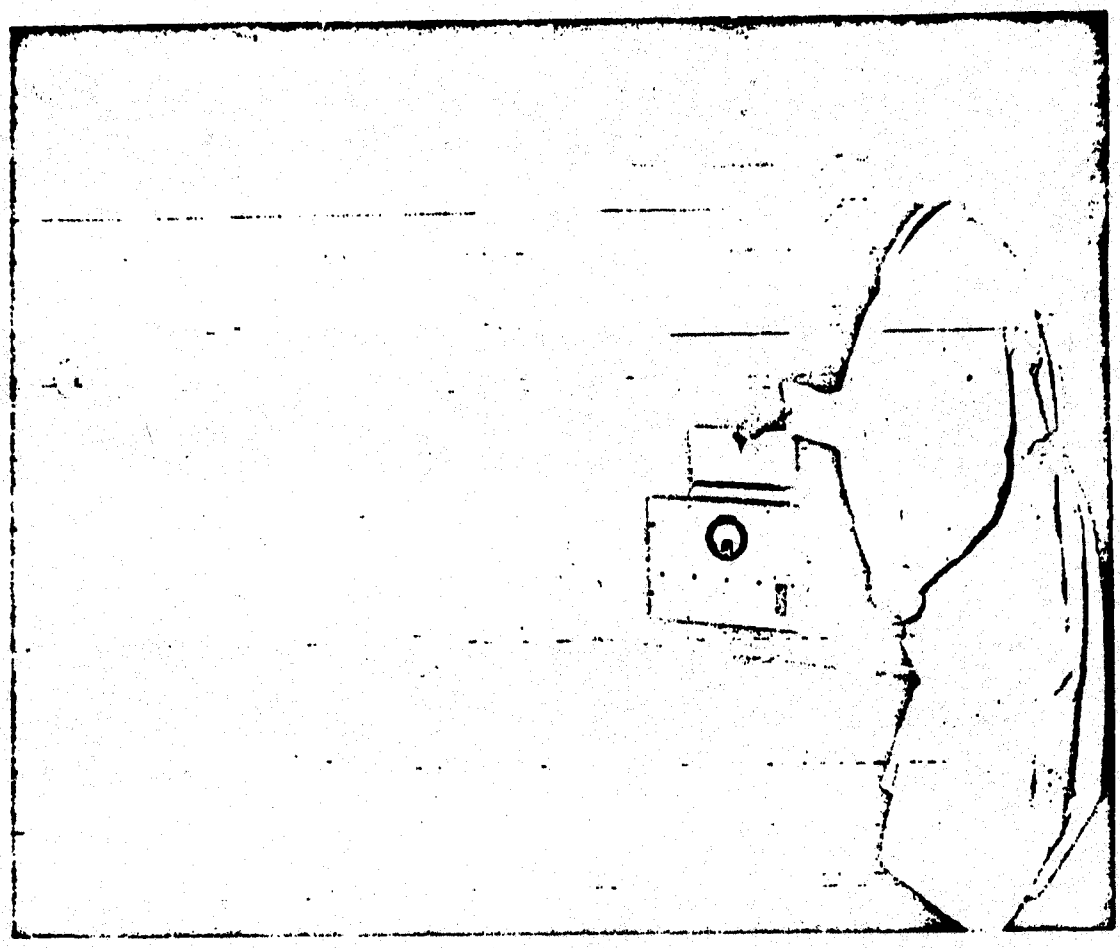


Fig. 21. Professor Cazzamalli examining the "generator."

under certain conditions of psychic activity (psychosensory) the pertinent cerebral zones functioning harmoniously, could give rise to particular effects of radiation. This capital point of my research in cere bral psychobiophysics will receive adequate treatment in the chapter on general considerations.

I had special triode oscillator units constructed from the beginning, as basic research instruments, since they are the most sensitive to electromagnetic waves.

System succeeded radio-electric system from oscillator complex .I. to oscillator complex O.IX with a wise utilization of all the improvements in radioelectric technique, then in full development, and

with the progressive elimination of the causes of disturbance, I reached an optimum stabilization with O.IX.

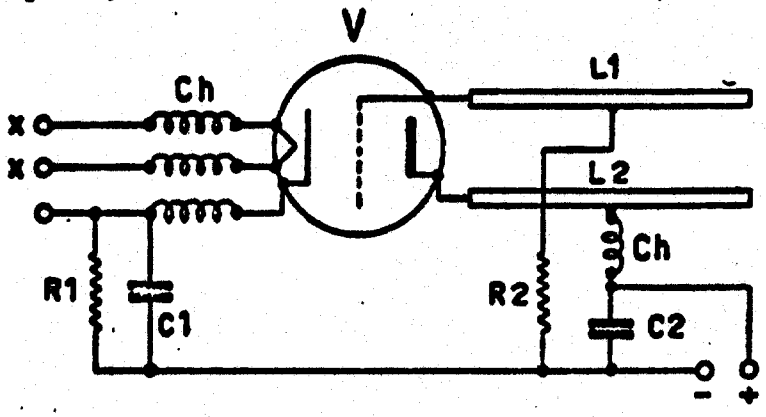
O.IX was conceived and constructed according to the type of triode oscillator unit for ultrashort waves after Hartley's scheme for frequencies tunable to oscillations of about 1 meter wavelength (frequency of 300,000 Kilocycles).

I redescribe this early experimental method because, as I showed in the series of experiments performed with O.X., this latter instrument was really a whole new radioelectrical apparatus, quite different from the preceding ones, which notably improved the technique and the results obtained in our work on electromagnetic phenomena radiating from the human brain under cerebro-psychic conditions already described.

DESCRIPTION OF THE SUPER-REGENERATIVE AND SUPER-HETERODYNE MICROWAVE SYSTEM O.XI

Oscillator

This oscillator utilizes a resonant line L1-L2 which element determines the frequency of the oscillation generated (Fig. 22).



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OSCILLATORE 600 M Cicli

Fig. 22. 1) 600-megacycle oscillator.

This line, of the half wave type, is connected at one end to the plate and to the grid of the triode V type 955 (acorn). The first tap of the line is connected to the plate power supply through a choke coil

Ch, and the second tap is connected to ground through a resistance R2; the condensor C2 together with the coil Ch prevents the radiofrequency current from passing through the power supply.

In the cathode and filament circuit of tube V, the appropriately proportioned coil Ch is inserted; a resistance R1 to which a condensor C1 is attached automatically biases the grid.

The separate power supply is appropriately stabilized. The frequency of oscillations generated can be varied by lengthening or shortening the lines L1 and L2.

Receiver

This is designed to receive the emission of the oscillator-generator described. The circuit is of the super-heterodyne type and is the most interesting part of the unit; it consists of an input circuit ahead

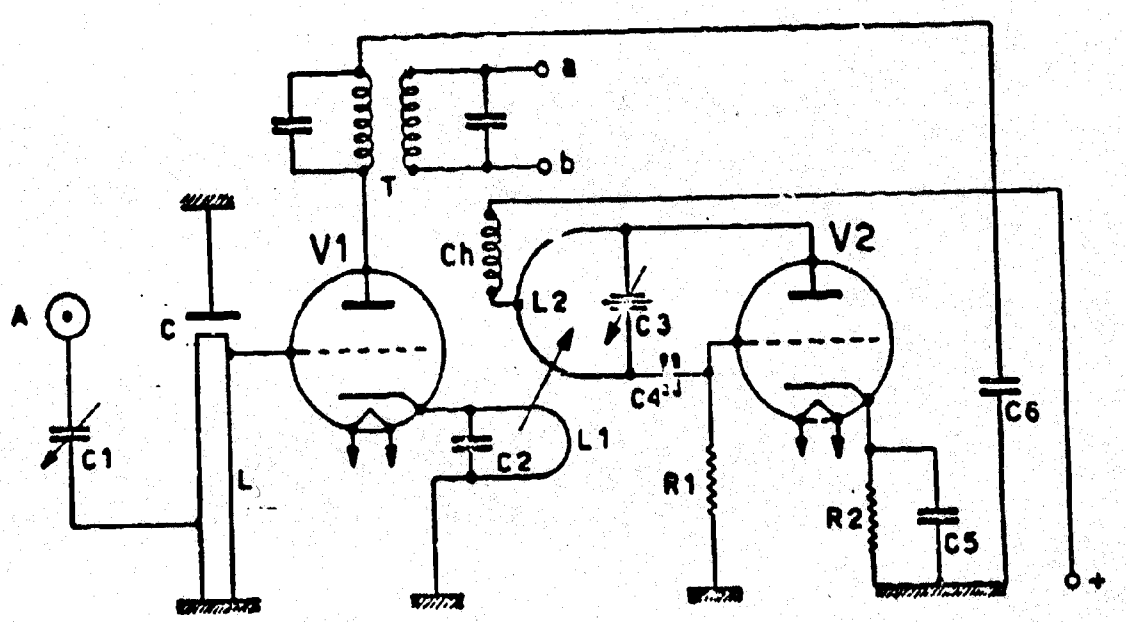


Fig. 23. Oscillator mixer.

of a mixer tube. The resonant element of the input circuit consists of a line L (Fig. 23) tuned by a condensor C which is a metallic disc which can be drawn to the end of the line L. To this is joined the

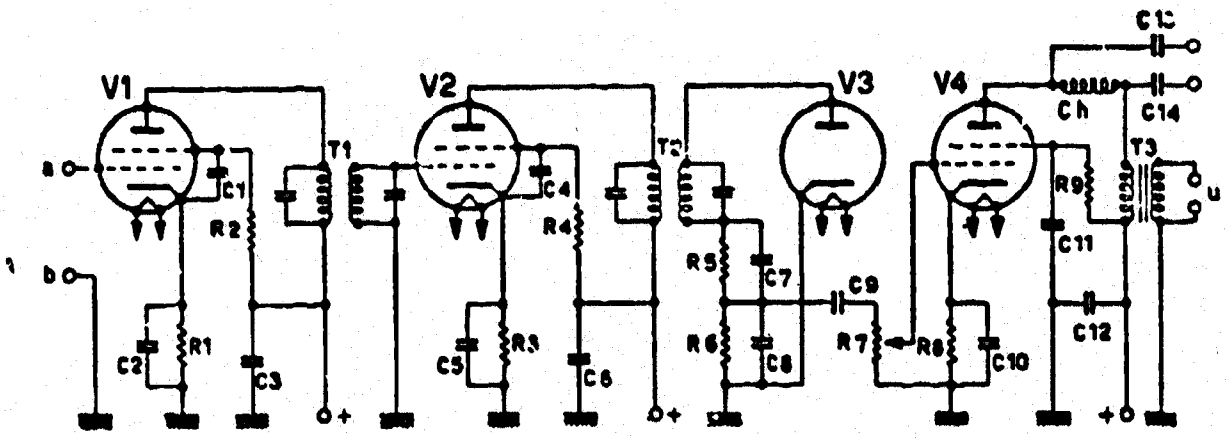


Fig. 24. Medium frequency amplifier – signal detector – low frequency amplifier.

antenna and a variable condenser C1 in series which varies the coupling between the antenna and the line L. Its free end is connected to the grid of the tube VI (acorn). In the cathode circuit we nind a coil L1 which couples to the circuit of tube V2. In the plate circuit of V1 is located the primary of the transformer of intermediate frequency (30 Mc).

The tube V2 (acorn) is an oscillator of the desired frequency to which the input circuit of tube V1 is tuned; thus we use the second harmonic to obtain beats of medium frequency in tube V1 which functions as a mixing tube.

The oscillatory circuit L2C3 of Tube V2 is a classic Hartley and C3 is a variable capacitor driven by a reduction gear which permits fine tuning.

The intermediate frequency amplifier (Fig. 24) which follows the mixer is usual and utilizes two tubes, V1 and V2; the intermediate frequency transformers T1 and T2 are designed to obtain a large band

width in order to furnish constant amplification between limits of the frequency of the oscillators whether of the transmitter or of the receiver. The transformer T2 is followed by the diode detector V3 and by the audio amplifier V4.

Resistance R7 with a variable tap regulates the signal applied to V4. In the plate circuit of this tube are located an induction coil C H and a low frequency transformer T3 whose secondary supplies the recording apparatus with power. Through the capacitor, C13, one can derive higher frequency components from the plate circuit. The capacitor C14 is connected directly to the high impedance : at the primary circuit of the transformer.

The power supply of these units is stabilized and filtered, using the normal rectifying tubes. The electric circuit of this power supply is standard and need not be described in detail.

The two units (Figs. 25 and 26) placed in a shielded cage are about a meter apart and the subject is between the two on the side of the receiver, semi-reclined on the little divan.

The antenna used is made of a copper wire which runs 50 cm. around and above the subject's head, parallel to it, and attached to the walls of the shielded cage by insulating supports (Fig. 27). Another type of antenna consists of a metallic band in copper, 45 millimeters wide, which is placed around the subject's head from the occipital to the frontal region (Fig. 28).

During the experiments we used either one or the other antenna and sometimes both together. We observed no difference in using either one or both together (Fig. 29).

An oscillation or disturbance coming from the subject reaches the antenna of the receiving apparatus. This apparatus, already influenced by the oscillation produced by the generator, will reveal the variations

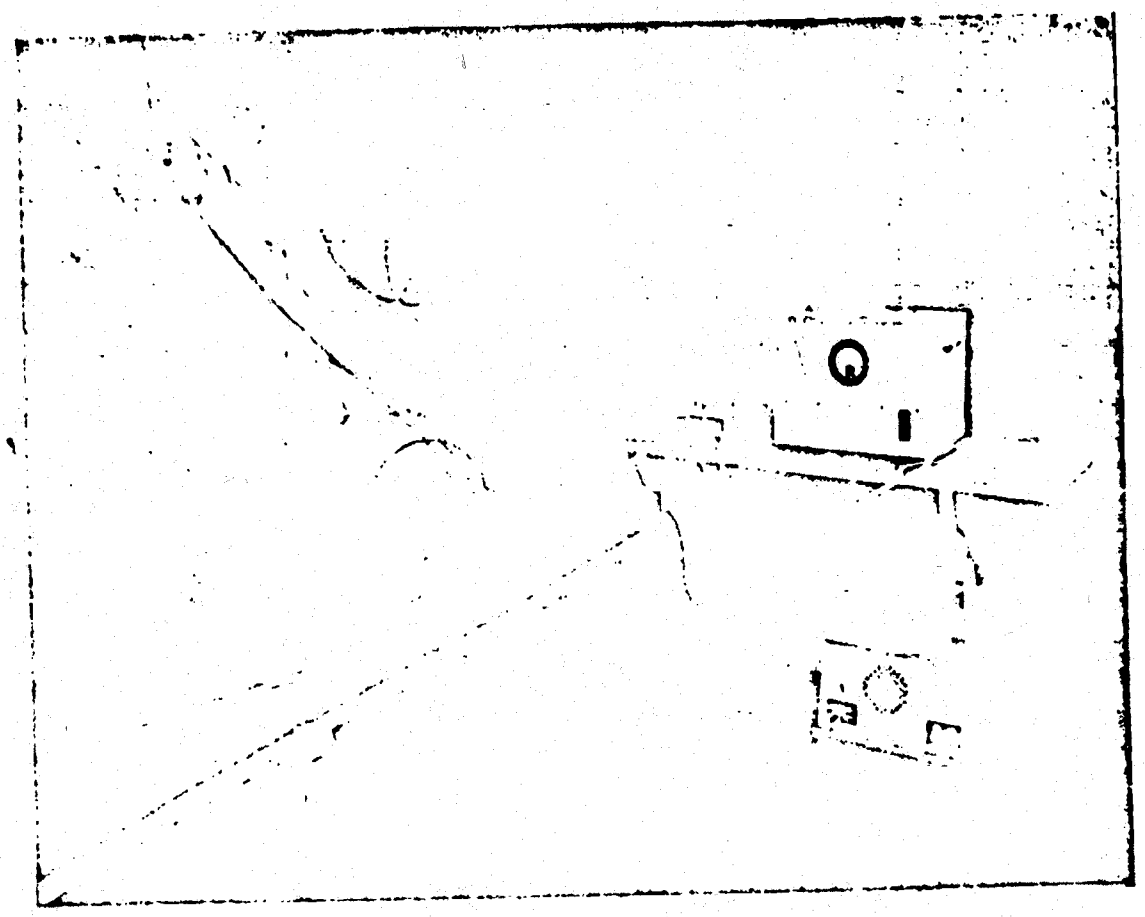


Fig. 25

caused by the addition or subtraction of the two oscillations present, the permanent one and the one coming from the subject. This latter is doubtless variable in frequency and amplitude, consequently the variation of the permanent oscillation in the receiver cannot give rise, after the detection, to well defined and constant sounds, but rather to hisses and impulses.

I prefer to use red light to illuminate the shielded cage during the experiments in order to encourage a state of greater psychic tranquility of the subject in general and of the sensitive subjects in particular.

From one to three experimenters using earphones can follow the

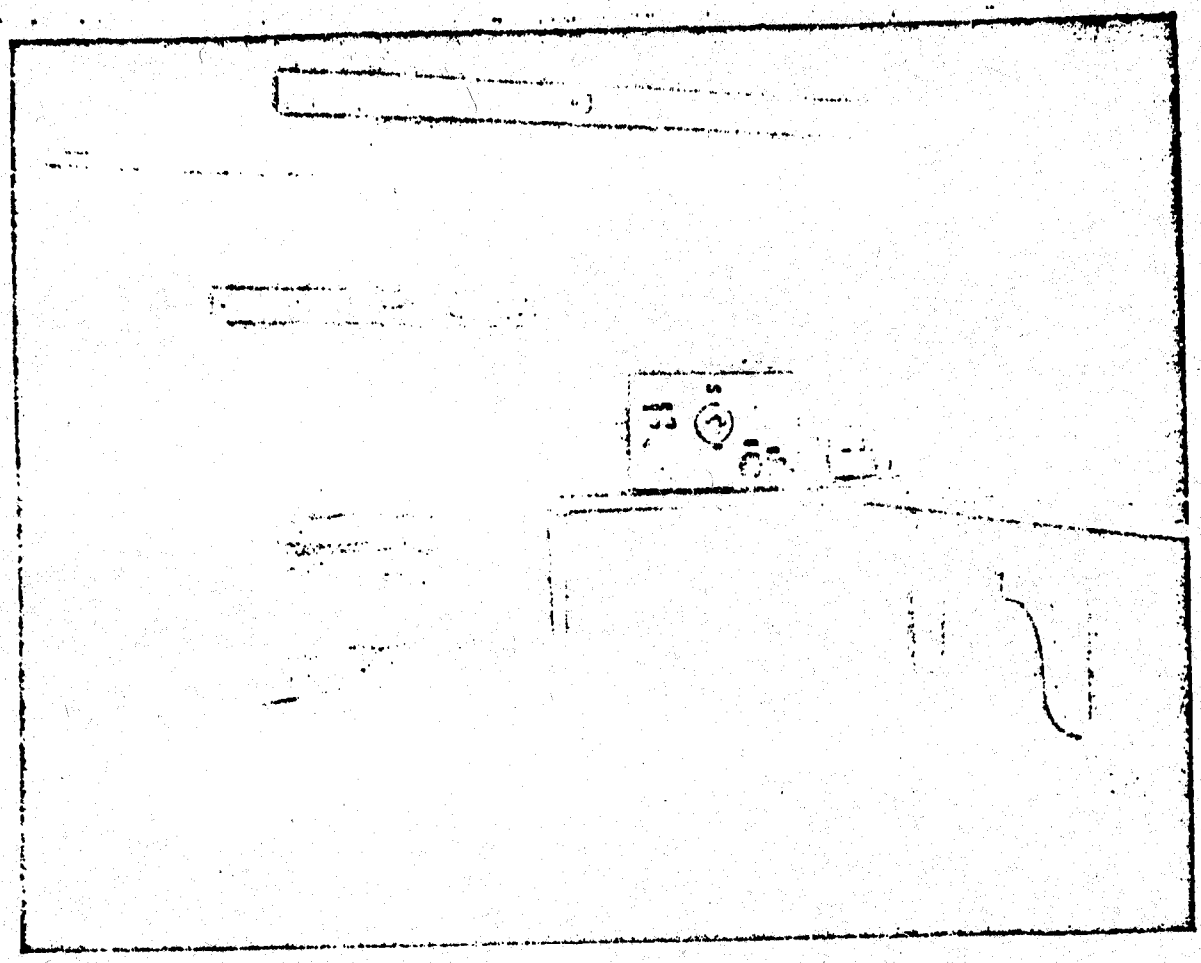


Fig. 26

phases of the experiment, being able to monitor the instruments and the subject at the same time.

The recorder is attached to the microwave unit; this recorder consists of an oscillograph with a vibrating cord for photographic recording on film, placed in the darkroom next to the shielded cage. (Fig. 12, page 142). The switch which starts and stops the film is in the darkroom; a wooden guide lever activates it from the shielded cage.

The transport speed of the film is one centimeter in 7/10 of a second.

When the generator and receiver are checked and tuned the experimental subject is introduced into the shielded cage; he installs him-

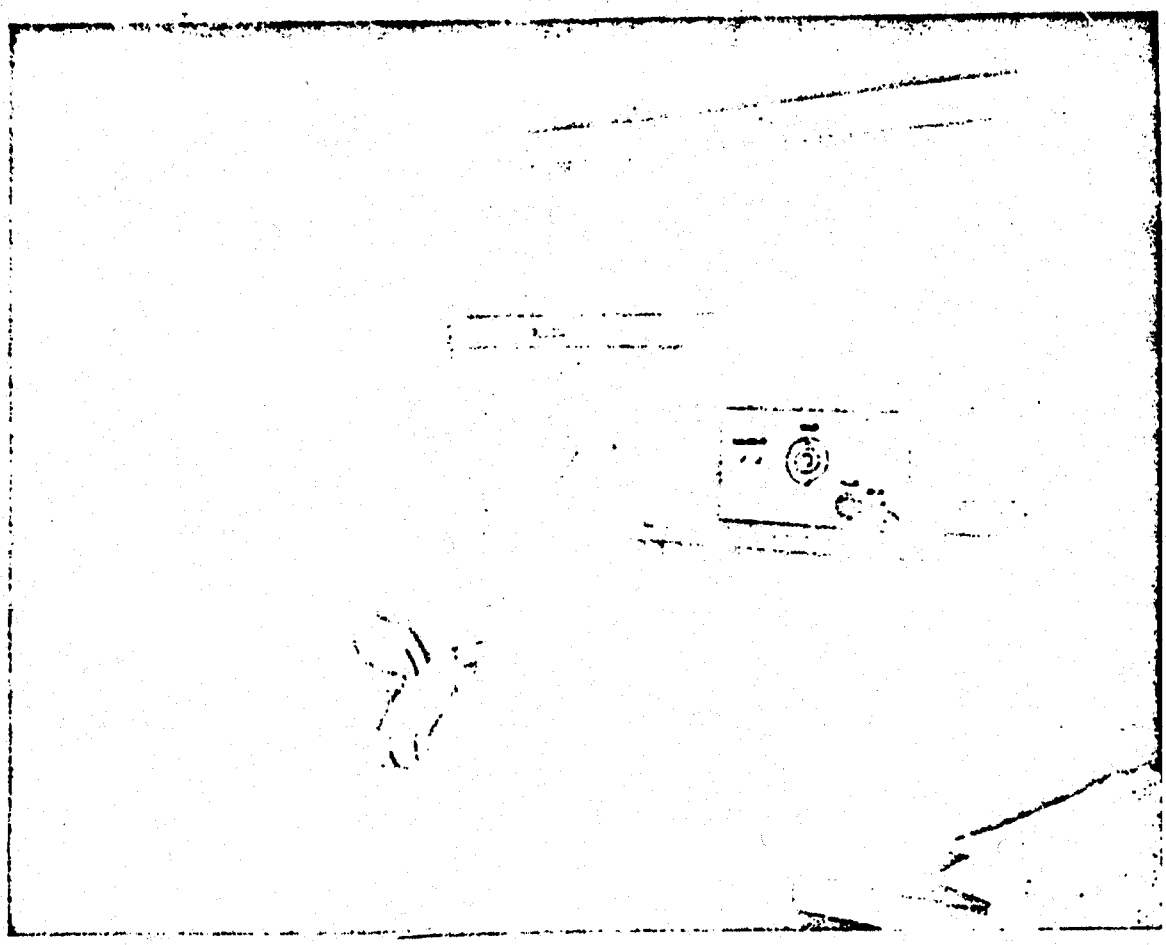


Fig. 27

self, as we have said, on the little divan, and we put the metallic plate, loosely coupled to the receiver by a plate which forms a condenser, on his head. Or we leave the copper wire antenna in place which runs about 50 cm above and parallel to his head without using the metallic plate. Or we use both antenna systems together, the antenna and the metallic plate applied to the subject's head.

Normal subjects (oneirics) are asked to close their eyes and abandon themselves either to a dream state or to sleep. In these subjects, as is well known, sleep and half wakefulness are preceded or directly accompanied by hypnotic hallucinations. Then these subjects are asked to abandon themselves, always with their eyes closed, to the greatest

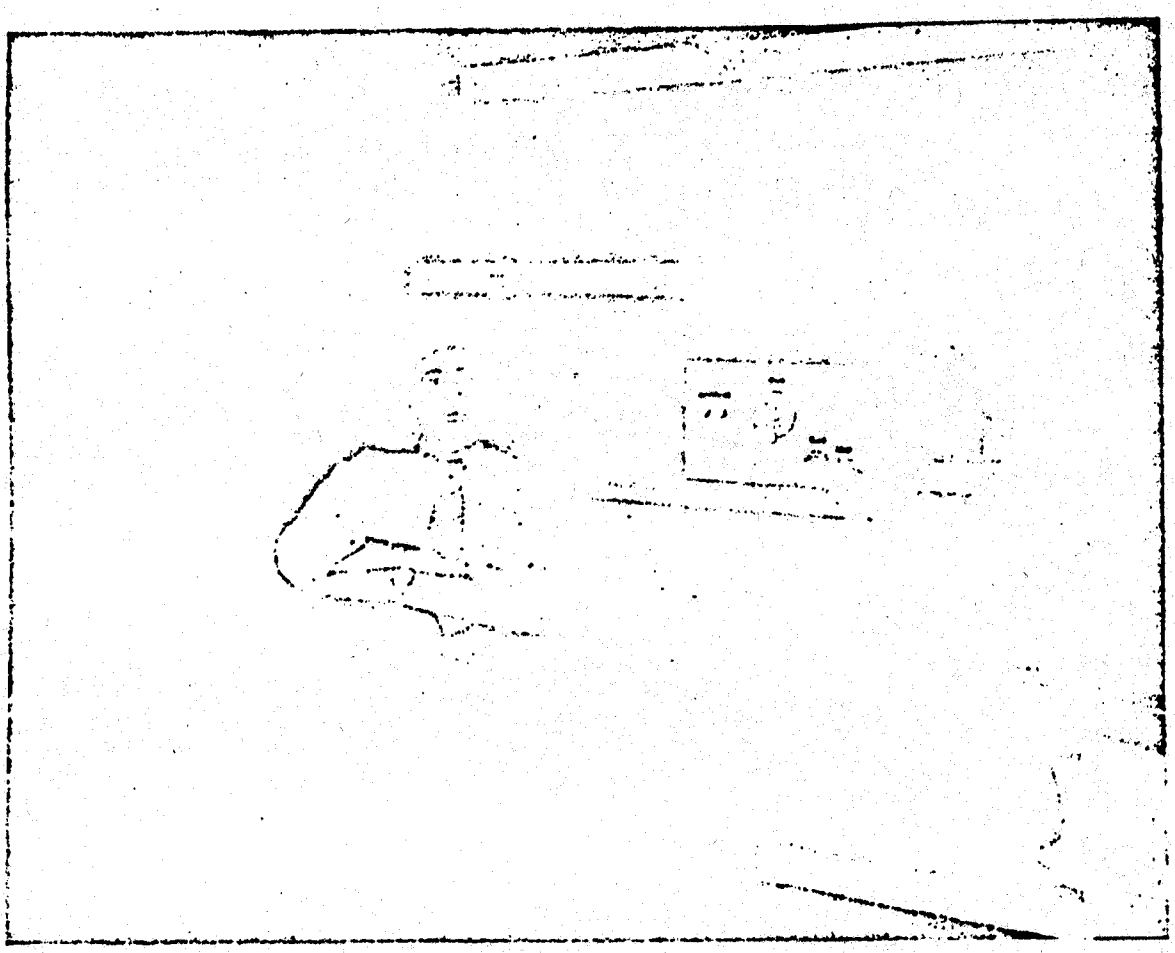


Fig. 28

possible quiet and psychic inactivity in order to reach what is called the psychic passive state. This state is then abruptly interrupted with a psychosensory stimulus of recall or excitation referring to facts or persons or major emo-affective significance to the subject.

I use this experimental method when I want to cause that effect or psychophysical reflex which I have called the cerebropsychoradiant reflex which consists of the sudden influencing of the oscillator system, effect of electromagnetic phenomena radiating from the brain of the subject, reaction to a well-suited and unforeseen stimulus, which causes a state of psychosensory excitation in the subject.

Psychopathological subjects (hallucinators) are left to themselves,

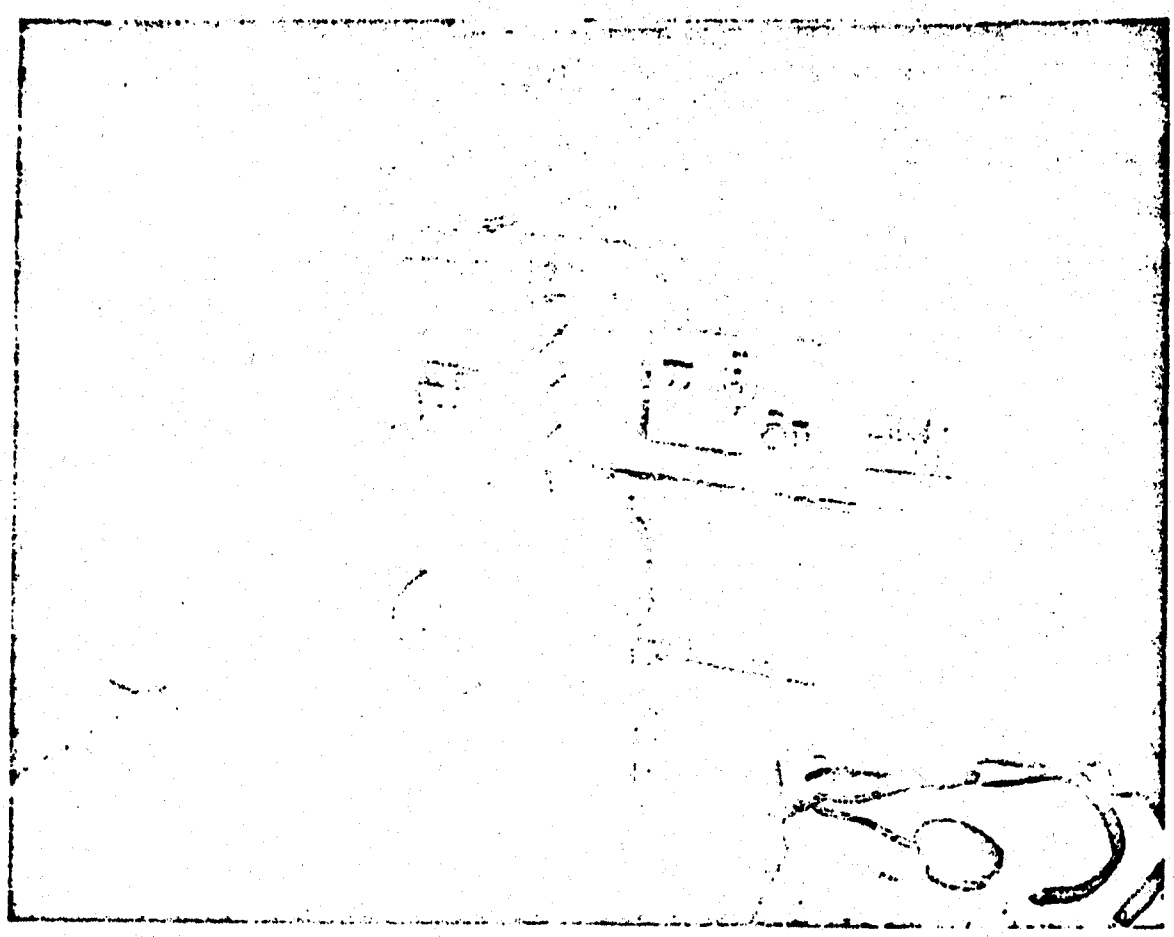


Fig. 26

though we do suggest that they close their eyes, so that the attenuation or exclusion of ambient sensory stimuli will promot the hallucinatory effervescence.

For the telepsychic subjects (sensitive), that is the so-called clairvoyants, telepaths, cryptesthetics, hypnotized subjects, well-water diviners, radiesthetes, graphognomes, chiromantists, cartomantists, the experimental procedure is adapted to the particular necessity of the metapsychic phenomenon to be explored.

Subjective metapsychics, so called, concerns in fact the psychological phenomena (mental) of lucidity or clairvoyance, telepathy, accidental or experimental cryptesthesia, well water divining, radiesthe-

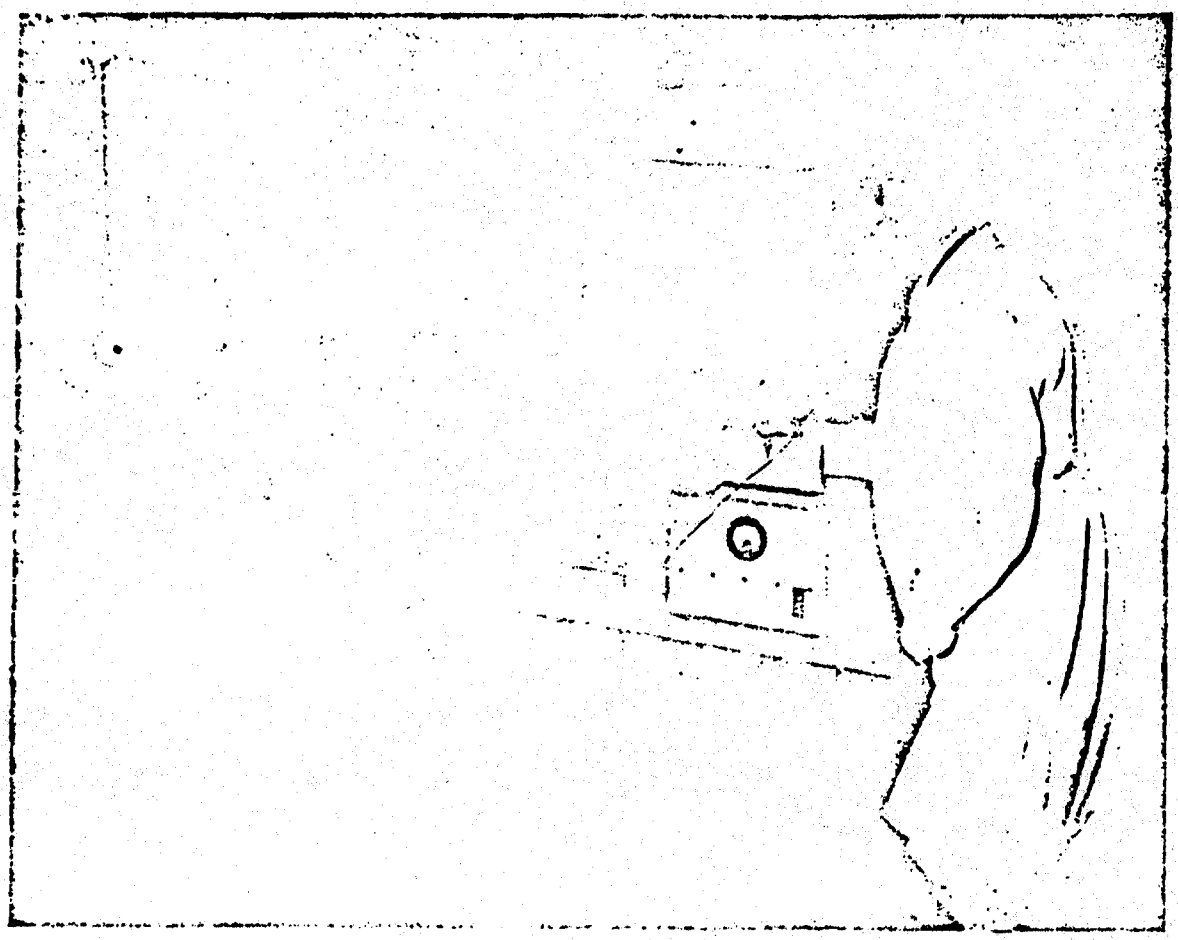


Fig. 30. Prof. Cazzamalli checking the "generator" and the "receiver" on the earphones.

sia, graphognomy, cartomancy, chiromancy. A human subject is called sensitive when there is a sine qua non condition for mental or subjective metapsychic phenomena. All of these subjects, after pre-experiments to determine their specific faculty or sensitivity, are systematically asked to close their eyes and to abandon themselves to fantasy, to dream states, psychosensory conditions habitual to such subjects and characteristic of their telepsychism.

In these cases we are trying to explore the particular psychophysiological state of slight trance with its related specific cerebropsychic sensory activity in its essence, intensity and duration, together with the phenomena of undisputably metapsychic nature which may emerge.

For example: to explore the state of slight trance in well water diviners from my own experimental psychobiophysical point of view, I proceeded according to the following scheme of examination, methodically followed.

After the subject is seated on the little divan, and the instruments are perfectly tuned and functioning, I ask him to abandon himself to the greatest possible psychic tranquility, that is to the psychic passive state. After a few minutes, I order the subject to proceed, in his habitual state of psychic recollection to look for water, just as though he were acting on the ground outside.

In a second part of the experiment, I warn the subject that I am going to place a bottle of fluid (without stating its nature) on his legs or his abdomen; I have coded these bottles with numbers indicating their contents (benzene, water, alcohol, oil, wine); then I ask him to concentrate his attention on them and to tell me the result of his search.

I repeat the same experiment with metals such as lead, iron, copper, gold.

In a third part of the experiment, I observe the psychosensoriality of the subjects in sleep or in reverie as in oneiric subjects. Then I interrupt a psychic passive state with the brusque injunction: "look for water," etc.

According to the results of the experiment, I then examine the pragmatic cryptesthesia with the bottles of liquid or with the metals, whichever will give me better reaction, this time warning the subject of the nature of the liquid (that of the metal is visible) that he is to examine.

Between one part and another of the test, or between two tests, one must intersperse brief rest periods, depending upon the assumed and

variable capacity for resistance of different subjects.

Concerning the sensitive subjects taken as a whole, I will say that in the state of slight trance there is effectively a partial dissociation of the psychic personality, greater or lesser depending upon the psychic type of sensitive subject.

The sensitive subject can fall into an autohypnotic attack, similar to that of the medium, with split personality replacing the normal, but ordinarily, he is in a stateof apparent normality with automatic writing, explorations of the terrain in the well diviners, of the hand with the chiromatists, of writing in the graphognomes, of objects in generic cryptesthetics. But in these cases, the expert in psychophysiology and neuropsychiatry notices that the subject though he may participate in conversation or write or walk, is in a state which one can call expectant attenuation. He is as though cut off from his external environment. He is in a half-dream state similar to that of fantasy, creative artistic activity, philosophic or scientific speculation, with automatism evident in his actions. We also know that the sensitive subject is quite capable of entering, leaving, reentering and again leaving that characteristic psychophysiological state which I have defined as slight trance.

This state is accompanied by neuro-organic, neuro-muscular, neuro-vascular, neuro-psychic reactions, which demonstrate the involvement of various cerebro-somatic and cerebro-psychic arcs. It is during this state that the subject acquires knowledge of the reality of facts that ordinary activity of the senses does not grasp from the outside environment; the subject sees places, persons, etc., who are far away, or what is in other minds, or scenes taking place far away, going as far as the prediction of the future in exceptional circumstances. He sees; that is, in this state there occurs what one could call a truthful dream.

From the moment that the subject closes his eyes and enters a dreaming or phantasizing state with relatively intense visions, or recalls persons and events which have been of major emotional significance to him with plastic vividness, or has hypnotic hallucinations in the half-wakeful state, or dreams vividly while sleeping, or has induced or spontaneous hallucinations, or enters into a state of slight trance as do the sensitive subjects, the experimenter stops all psychological intervention. He simply remains at his observation post and awaits the mimicking expression and poses of the subject, and the acoustic reactions on the earphones which in positive cases consist of rustlings, either isolated or successive impulses or hissing.

I must add that we urge the subject at the beginning of the experiment to keep as physically still as possible, and not to worry about telling us the theme of his visions when they arrive, nor immediately afterward, but only when special psychic conditions have subsided and he has returned to the wakeful state.

This experimental detail was suggested to me by repeatedly noticing that when the state of sensory charge with its accompanying emo-affective tension is discharged through motor, vascular and glandular expression (passionate reactions, flushing of the face, cries, wails) the phenomenon of radiation stops abruptly.

The film of ten or thirty meters length can be projected cinematographically. Since we can start, stop and space the film, it can easily be read relative to the psychosensory phenomena exhibited by the subject. Typographical restrictions force me to limit the reproductions of these films to short positive sections chosen among the most demonstrative. The radio-cerebro-psychic oscillogram which reveals electromagnetic phenomena radiating from the brain in intense psychosensorial activity, I have called cerebro-psychic radiogram, or in a single word:

radio-cerebro-psychogram (RCPG).

I want to point out that along with the positive films, there were many negative films, i.e., blank ones, due to the absence of the indicated particular psychosensory phenomena or by their extreme weakness; either the subjects proved to be absolutely inert, that is lacking in psychosensory vivacity, or they were in transitory conditions of quietude (menstrual period in women, states of organic illness, etc.) and among those gifted with intense psychosensoriality, there were false sensitives who were really simple automatists, and false hallucinators, in reality exhibiting only interpretative delirium.

The human subject is in fact extremely labile psychically speaking; particularly within the confines of paranormality and pathology, but even beyond these confines, some accidental emotive reaction or casual variation in general conditions suffice to inhibit the phenomena, at least momentarily.

In that case, the subject does not enter, nor does he succeed in entering into that psychic state favorable and necessary for the emission of psychosensory phenomena which under ordinary and favorable conditions would manifest themselves in all their splendor.

The subjects giving positive results for intense psychosensorial activity are subdivided into three groups, as I have said: normal (ONEIRICS) pathological (HALLUCINATORS) and telepsychic (SENSITIVES). Naturally, the psychic phenomenology expressed by these subjects had respectively the characteristic of normality (from the oneiric state to true dream which accompanies sleep and which constitutes a true normal hallucination, up to artistic hallucination) of pathology (true hallucinations, particularly visual) and telepsychism (state of slight trance in the sensitives with exhibition of subjective, that is mental, metapsychic phenomena).

Each radio-cerebro-psychogram is preceded by a brief explanatory note on the psychic personality of the subject and followed by an indication of the psychic, psychopathological or metapsychic fact associated with it.

Let me point out that only the complete reading of the entire film permits one to follow its development in relation to the intense psychosensory phenomena and to the electromagnetic phenomena radiating from the brain. This reading can be done directly on the film or by cinematographic projection.

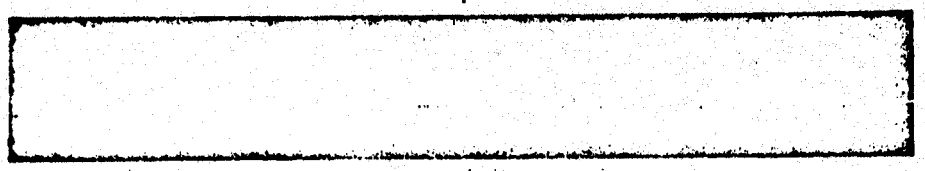
The film sections chosen for typographical reproduction, of 10-12 cm length must therefore be considered as parts of an organic whole, that is, the entire film of the experiment, exposed in strict correlation to the psychosensory phenomenology of the subject, which emerged during that particular experiment.

Theconsiderations, both general and particular which I shall discuss after the illustrations of the RCPG refer then, not to these brief sections here reproduced, but to the entire film from which they are taken, the whole film being the complete physical documentation of each experiment for each single subject.

In the present paper, I have limited the reproduction to a few among the clearest and most interesting cerebropsychic radiograms and radio-cerebro-psychograms (RCPG) for the three indicated groups of subjects, examined, studied and experimented upon from 1941 to 1954, giving preference among hundreds of experiments to those most demonstrative of the typical personality of the subject, oneiric in the normal group, hallucinatory in the psychopathological group, sensitive in the metapsychic group.

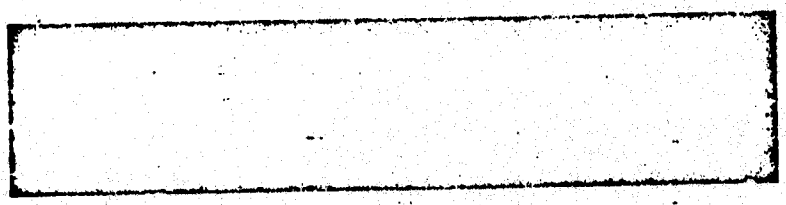
RADIOCEREBROPSYCHOGRAMS: RCPG OF NORMAL SUBJECTS GIFTED WITH INTENSE PSYCHOSENSORIALITY (ONEIRICS)

C.A. — Male subject, fantasizing with very lively oneirism.



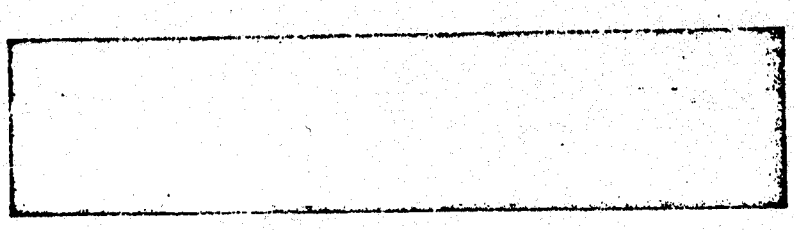
RCPG related to intense visual, almost hallucinatory recall of the subject's son (dead) in maritime dress during his holiday when he came from China.

M.E. — oneiric subject.



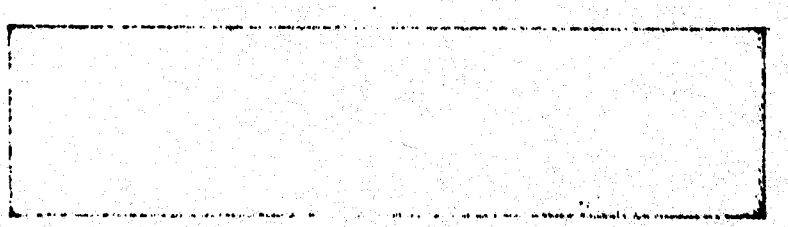
RCPG related to complex and very clear cinematographic visions of persons hostile to him.

M.R.—oneiric subject gifted with very lively visual psychosensory activity, auto and hetero-hallucinatory.



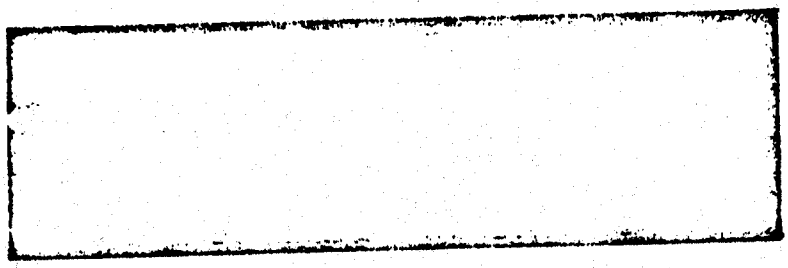
RCPG related to almost hallucinatory visions, with eyes closed, of the subject's mother when she was alive.

G.V. — Subject gifted with intense visual psychosensoriality with very lively frequent oneirism in the state of reverie.



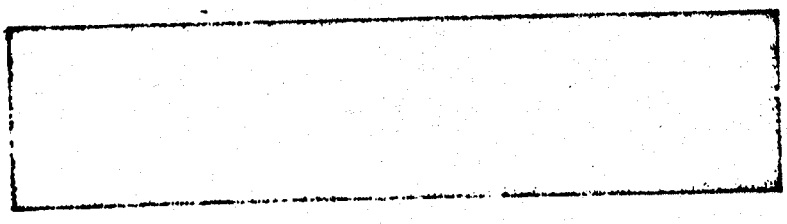
RCPG related to very distinct visual recall of the subject's fiancé. The last positive part of the film.

M.E. — Subject gifted with intense visual psychosensorial activity dreaming easily in reverie with unusual oneiric-hallucinatory intensity in sleep.



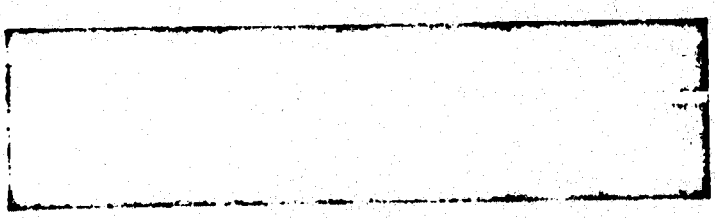
RCPG related in the 1st and 2nd parts to the order given to the subject to recall familiar scenes: The reaction is negative and the subject is stupified. In the 3rd part of the film the subject is asked to close his eyes and to abandon himself to sleep and to allow full play to any visions which arise: intense cerebro-psycho-radiant reaction which is repeated in the 4th and 5th parts of the film, which found the subject still in a dream-filled sleep. At intervals, the regular static is interrupted by positive reactions. When the subject awakened, he spoke of multiple visions of scenes and persons, with himself acting in many of the dreams which were truly animated scenes such as: a cow was chasing her and she was terribly frightened; dream of being in her own garden when she was 10 years old, when a man tried to grab her by her sides and breast, and she fled from him in a state of great alarm; dream of being at the Neurological Institute with very lively visions of doctors, nurses and attendants and of the subject herself when a test with rachiocentesis was done on her, whose diagnostic result was negative. This film is a quite valid test of the controlled correlation of oneiric phenomena in sleep with the recorded radiant electromagnetic reactions.

O.E. — Subject gifted with lively visual, oneiric psychosensoriality.

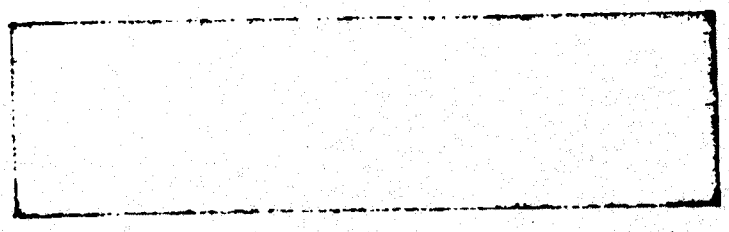


RCPG related to oneiric vision of a panorama with the castle near her own house and the inside of the beautiful palace.

B.L. Painter quite gifted in visual psychosensoriality.

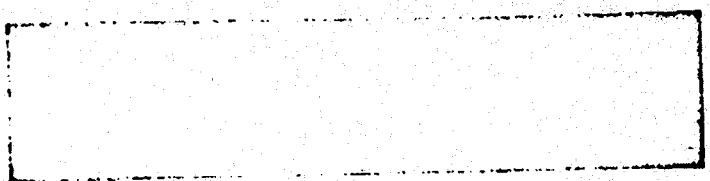


RCPG related to an intense vision with full particulars of the dolomite mountain of southern Grigna, reproduced at the time with a drawing pencil, and quite clear in each detail. Perfect correlation of the last part of the film to the vision and to the drawing of the southern Grigna with cerebro-psycho-radiant reaction.



2nd RCPG related to intense hallucinatory cinematographic vision of the scaling of the Andes chain, which the subject had recently completed with other alpinists. Perfect psychophysical correlation.

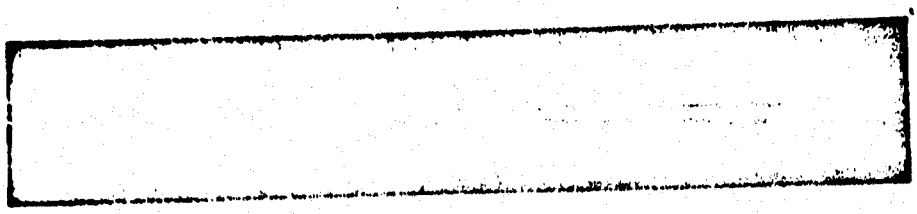
G.A. – Subject gifted with intense visual psychosensoriality typically oneiric, auto and hetero hallucinatory.



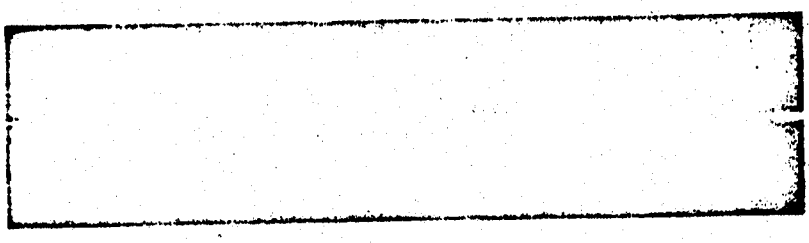
RCPG related to the oneiric state with very lively vision in dream of events from the subject's private life which occurred in previous years; cerebro-psycho-radiant reaction marked and quite individual.

RADIOCEREBROPSYCHOGRAMS (RCPG) OF PSYCHOPATHOLOGICAL SUBJECTS (HALLUCINATORS)

N.M. – Female subject 16 years old neuropsychopath of hysteric character with lively hallucinatory oneirism.

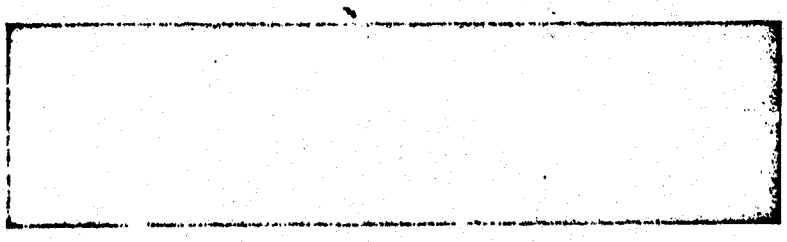


1st RCPG related to vision with eyes closed of her own grandmother fallen ill after the subject herself had been ill, and of her little brother on holiday and finally of the grandmother just dead. Evident psychophysical correlation.

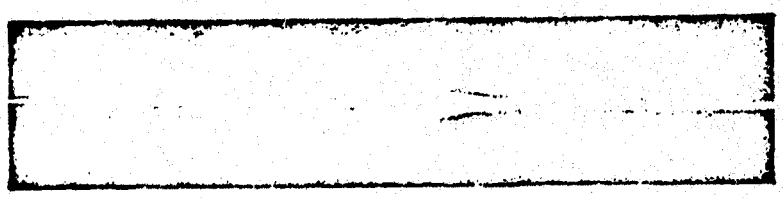


2nd RCPG related to the injunction made to the subject who was in the psychic passive state that she put herself to sleep with thoughts about a psychosexual trauma to which she was subjected when she was 7 years old. After five minutes, the subject was in a state of pre-sleep and clearly positive reactions were heard on the earphones while intense and quite clear oneiric hallucinatory visions developed on the theme of this trauma, on the person who inflicted it and on the family of that person. Evident psychophysical correlation.

M.E. — Female subject 17 years old affected with typical nervous hysteria who fallswith extreme facility and rapidity into an oneiric state. Auto and hetero suggestible and hallucinatory.

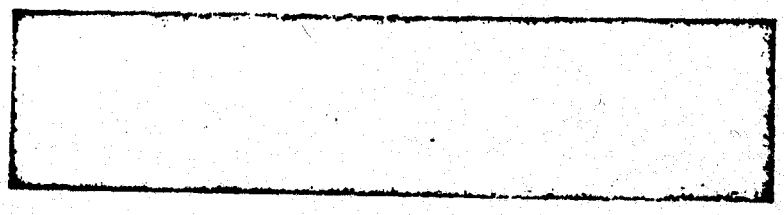


1st RCPG related to clear visions of the cinematographic type of persons who were of major affective and emotional importance to the subject.



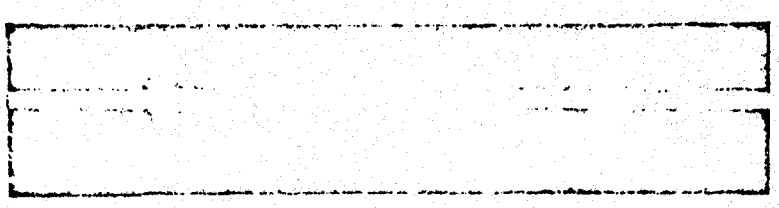
2nd RCPG related to hallucinatory oneirism, provoked, with images and very lively visions with erotic content, in which the subject sees herself as the protagonist.

O.F. — Hysteric subject with hallucinatory oneiric attacks with micro- and macrovisions on many different subjects.



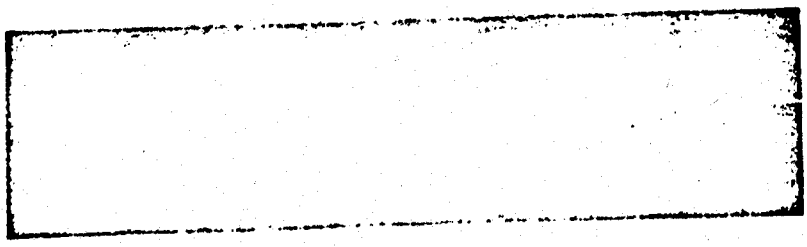
RCPG related to a vision of lambs walking backwands, while the subject was in an oneiric state with her eyes closed. From 16:22 to 16:35 the subject was in a state of slight trance, and the positive signs on the earphones appeared at 16:35 in correlation to the vision of a diver changed into an owl who advanced menacingly toward the subject. There followed an experiment of pragmatic cryptesthesia where I placed a closed box into the subject's hands. Almost immediately, the subject saw the numbers 5 and 8. In the box there was a card with a picture of the musician Spontini; on its border, one could distinguish on the black sleeve of his jacket, the number 8305 in white.

B.E. — Psychopathic subject with visual and vibrant acoustical hallucinatory symptomalogy.

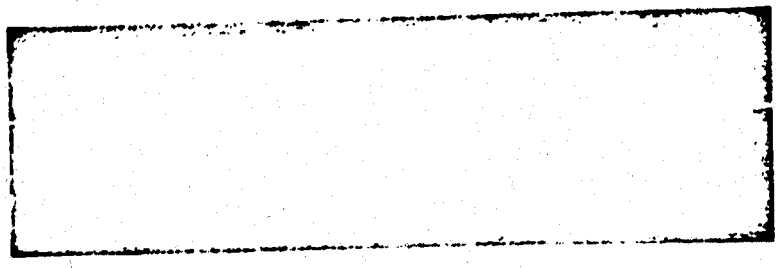


RCPG related to very clear hallucinatory vision with eyes closed of women who were persecuting her and whose voices she also heard urging her to "tell all." The psychophysical correlation of the visual and acoustical hallucinatory state with the cerebro-radiant radiation came out perfectly. When the subject was abruptly brought back to wakeful consciousness, both the psychopathic and the radiant physical phenomena stopped simultaneously.

M. I. — Psychoneurotic subject with notable psycho-somatic hysteria and lively oneirism in sleep and in reverie.

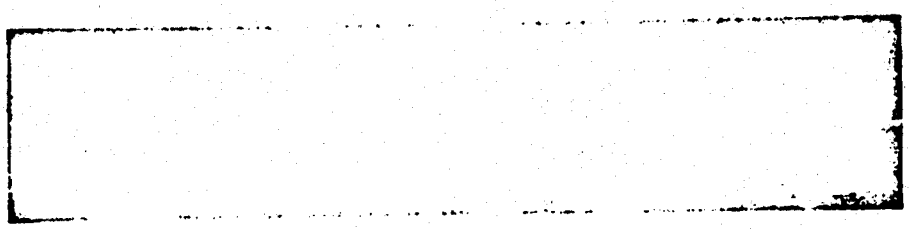


1st RCPG related to spontaneous hallucinatory visions characteristic of dreams, which emerged during a state of spontaneous sleep.

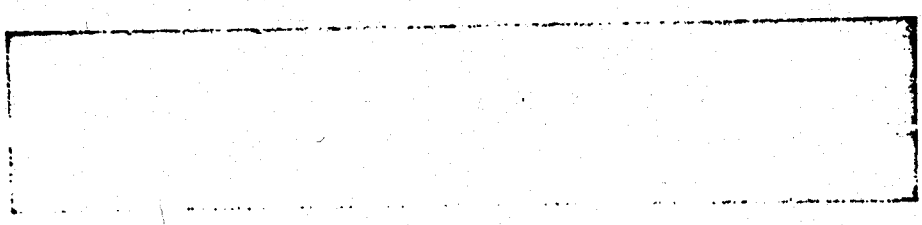


2nd RCPG related to visions with closed eyes of passionate scenes which actually occurred in the subject's recent past, in which his own character predominated in all of the different expressions. Typical psychophysical correlation.

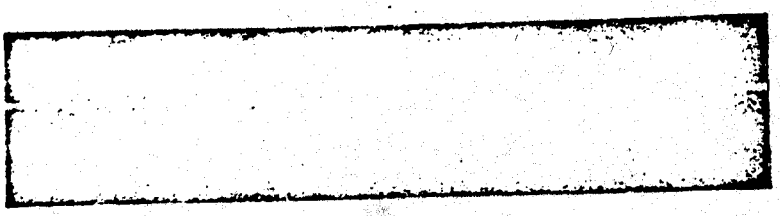
T.A. — Psychoneurotic subject with systematic nocturnal oneirism; his anxious dreams were repeated several times during the night with awakening always dominated by solar anxiety.



1st RCPG related to perfect hallucinatory visions of friends, places meetings while the subject was in a state of somnolence.

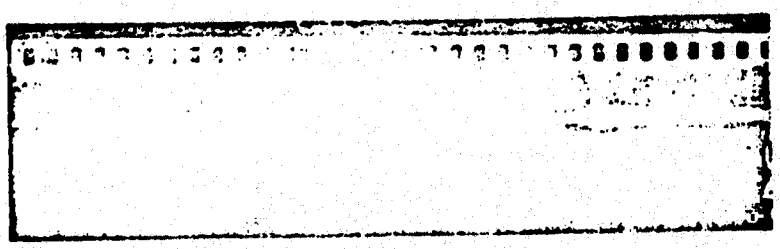


2nd RCPG entirely positive and in the same possible conditions related to the visual almost hallucinatory recall of [illegible] with full particulars which occurred during the subject's recent journey.



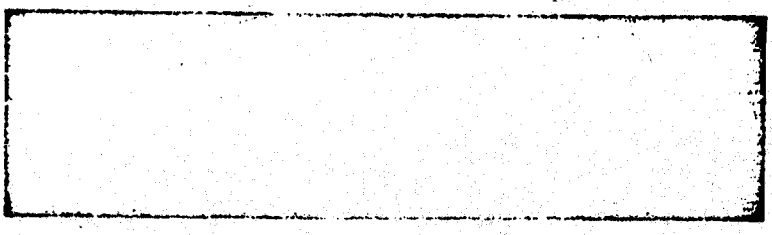
3rd RCPG related to a familiar emo-affective event which appeared spontaneously in the oneiric consciousness of the subject while in the state of reverie. The whole in psychic and radiant physical correlation.

C.P. — Psychoneurotic subject, hysterical with very lively spontaneous oneirism in sleep and in reverie.

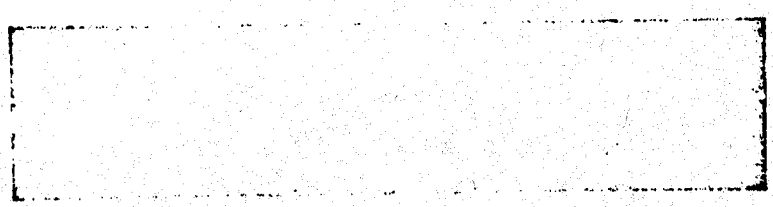


RCPG related to hallucinatory visiion in reverie of an emo-affective scene which occurred in a mountain pasture between the subject and a suitor.

M.N. — Subject cured of grave encephalitis. Painter by avocation with visual oneiric psychosensorial activity and rather revealing oneirism. Very marked visualizing capacity.

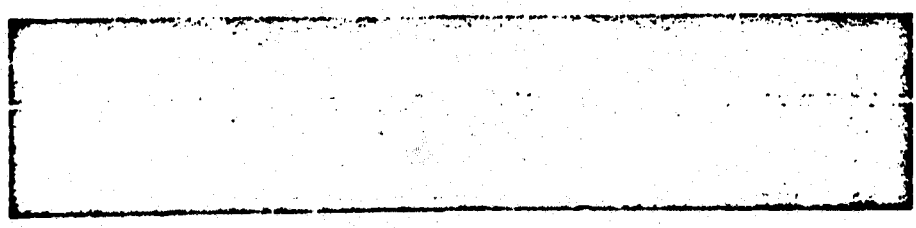


1st RCPG related to hallucinatory vision of the picture "The Pleiades" which he was composing with simultaneous intense radiant cerebro-psychic reaction.



2nd RCPG related to an almost hallucinatory vision of the head of St.

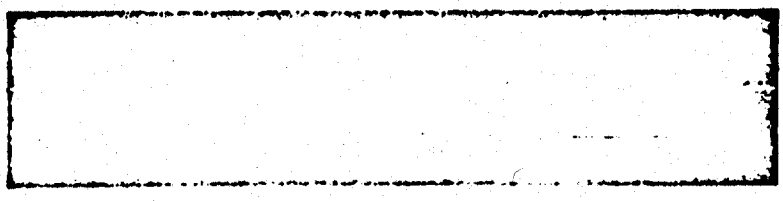
Joseph, one of his compositions; strict correlation of the cerebro-psycho-radiant reaction.



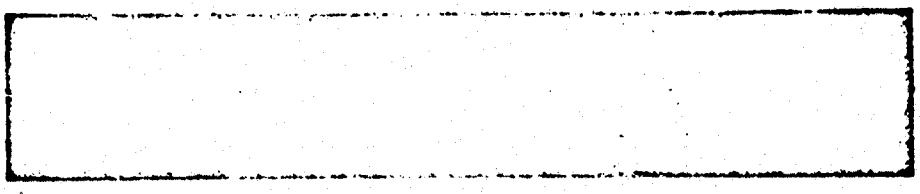
3rd RCPG related to almost hallucinatory cinematographic vision of a pugilistic scene with full particulars, with positive cerebro-psycho-radiant reaction. The subject was in spontaneous reverie with eyes closed.

RADIOCEREBROPSYCHOGRAMS (RCPG) OF TELEPSYCHIC SUBJECTS (SENSITIVES)

S.R. — Well water divining subject with positive search for water.

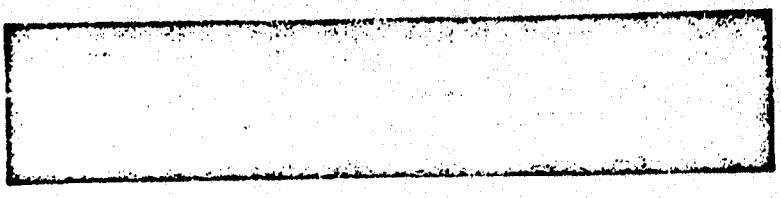


1st RCPG related to autohallucinatory oneirism of scenes related to his own familiary life, while the subject was in a state of reverie.

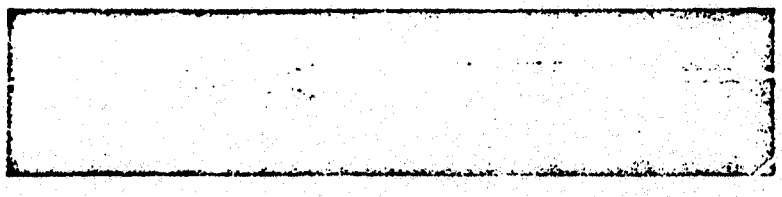


2nd RCPG related to the cerebro-psycho-radiant reflex induced with the injunction made to the subject in slight trance to search for water.

M.M. — Subject with remarkable hypnotizing capacity in whose family there were three sisters who were sensitives. He practiced hypnotism for the love of it and during his military service, he succeeded in obtaining anesthesia in a comrade who was operated on for an abscess while in a hypnotic state induced by the subject. It seems also that he was also gifted with curative powers.

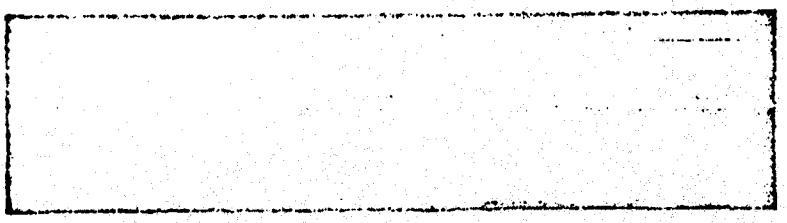


1st RCPG related to "passes" on the right hemicranial region of the patient affected with neuralgia of the trigeminal nerve.



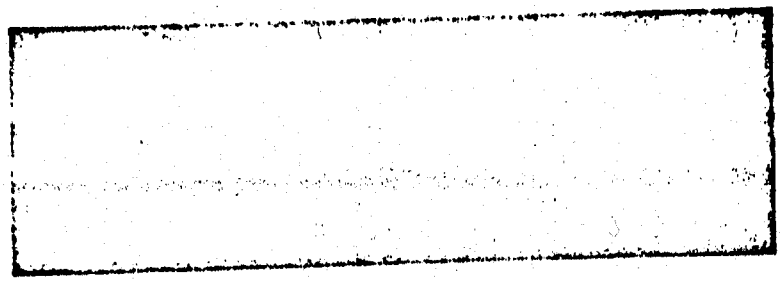
2nd RCPG related to hypnosis of a male subject who falls rapidly into hypnosis and responds to the suggestion when a book is placed in his hand that he is rocking a baby, that he is speaking with his fiancée; his actions and physiognomical reflexes conform to the hetero-suggestive state. The hypnosis is achieved by the method of eye fixation.

X.Y. Sensitive subject, at the end of his early years; subject to premonitory visions. Falls easily into a state of slight trance.



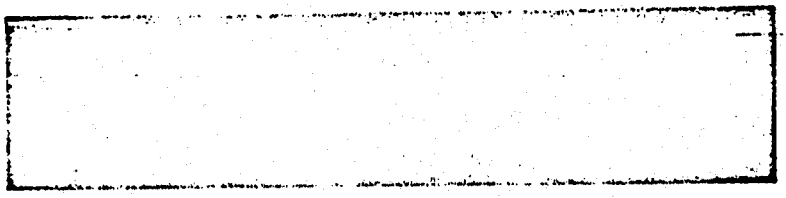
RCPG related to visions of Tibet, of a white city, of people dressed in white bathing in the Ganges, of a temple with a golden throne and finally a fiery colonnade with fantastic figures, their faces having the single eye of the cyclops.

L.G. — Sensitive subject whose mother presented remarkable medium properties. At 10 years old he had his first manifestations of sensitivity with metapsychic, spontaneous knowledge of real facts, in the state of somnolence (slight trance). In August, 1946, premonition in a dream, of grave misfortune to his own mother, verified in full particulars. The subject falls spontaneously into slight trance.

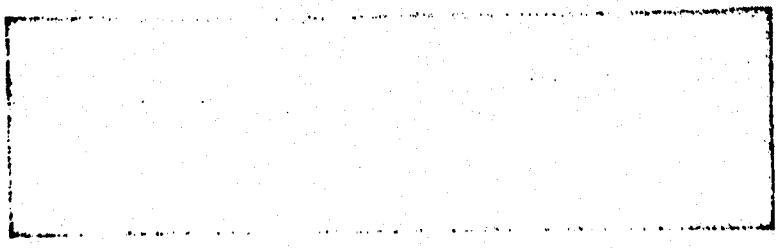


RCPG related to a stateof slight trance during which the subject had visions of the premonition of a flood with people in flight in a terrifying scene. This happened four months later in the northern plain of Italy. Evident psychophysical correlation.

G.A. — Sensitive subject with very marked cryptesthetic sensitivity first apparent at about 22 years with auto-premonition followed by well certified facts, and later confirmed telepsychic visions. The subject reads poker cards turned face down with precision. Falls easily into a state of slight trance, during which the telepsychic phenomena are manifest.



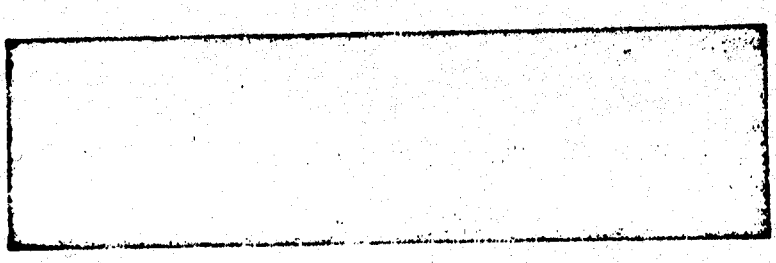
1st RCPG in perfect correlation to the state of slight trance with exact identification of cards in a poker deck which the doctor of engineering Eugenio Gnesutta (present at the experiment) was holding in his hands, and particularly of the red and black jokers.



2nd RCPG related to visions of cards inside a deck, identified as to place in the deck and as to value, together with precise description. Perfect psychophysical correlation with clearly positive cerebro-psycho-radiant reaction, while the subject was in a state of evident and marked slight trance indicated that in the deck of cards, the queen of diamonds was in the 14th place, the [illegible] was in the 16th place, between the 18th and the 15th card was a positive of diamonds, and be-

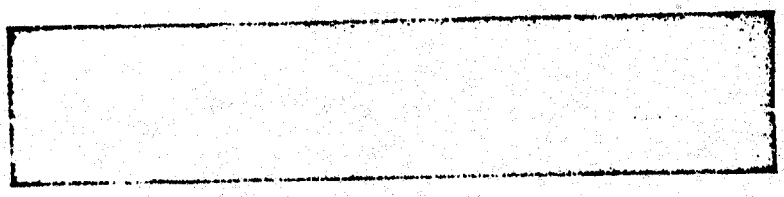
tween the 23rd and the 24th, a jack of clubs, and that the 30th card was an ace of spades. My collaborators the doctor of engineering Eugenio Gnesutta and Mr. Ferdinando Rosa were present at this experiment. The deck of cards was in my hands.

M.A. — Sensitive subject gifted with rare cryptesthetic sensitivity. He uses a small pendulum and samples of handwriting of persons unknown to him and keeps his eyes closed.



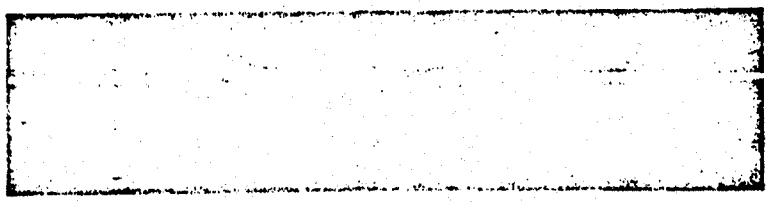
RCPG related to the state of slight trance during which the subject, using the handwriting of a person unknown to him, identifies exactly the psychic and physical characteristics and a malady from which he was currently suffering.

C.G. Subject with sensitive-medium properties, cryptesthetic who had a mummifying influence on small dead animals and on the organs of animals and on flowers. A hypnotizer and a "healer"; the subject entered into a state of slight trance with eyes half closed during the experiment.

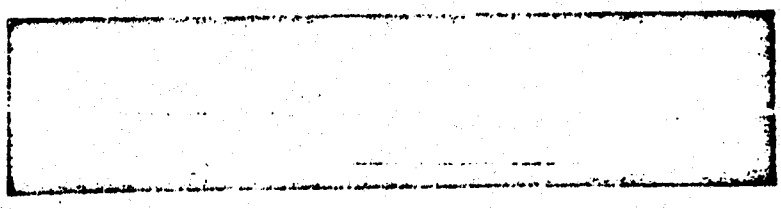


RCPG related to a state of concentration of thought for the purpose of mummifying; three dishes were presented containing small fish, eggs and a carnation. Exact psychophysical correlation.

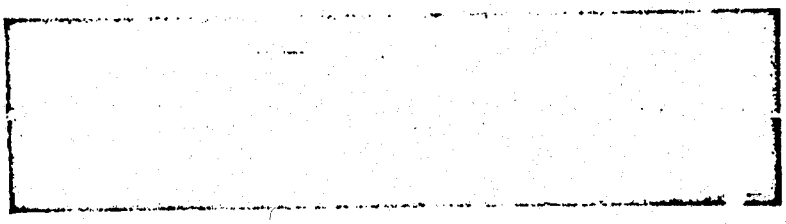
V.C. — Divining subject whose work resulted in numerous hydraulic wells in the colonies, confirmed by certificates from organizations and private individuals. Clairvoyant. He has also been shown to have healing powers.



1st RCPG related to a search, at my command, for water in the basement of the building where the experiments were carried out, to identify first if there was any, and if so, its depth. He uses a divining rod of Indian cane. The state of expectant attention (slight trance) is evident. Precise psychophysical radiant correlation.



2nd RCPG related to the search for carbon, holding in the palm of his right hand a piece of metallurgic coke and using the rod of Indian cane. He sais that he "feels" that there is carbon north east of him about 90-100 km. Positive reaction with correlation to this state which succeeded the slight trance. This was similar to his search for oil. It was observed that the cerebro-radiant reaction was in correlation to the moments of evident, marked slight trance which subsided gradually with the movements of the rod.

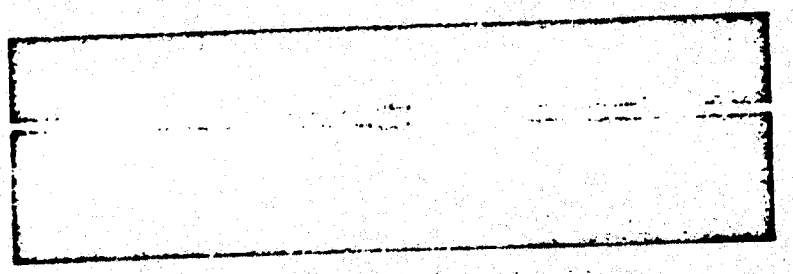


3rd RCPG related to the visualization from a distance of the patient S upon whom the subject intended to act as "healer."

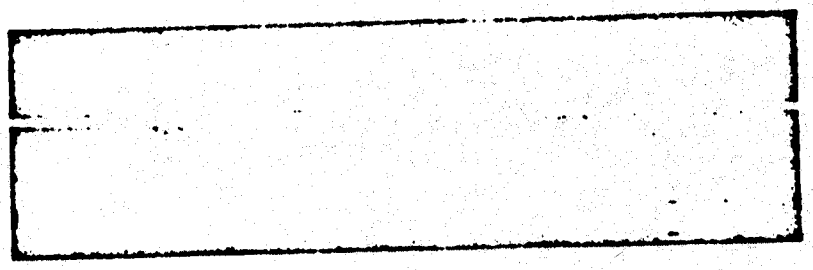
B.D. Cryptesthetic sensitive subject, specifically oneiric.

1st RCPG related to the recall of a [illegible] which happened to her own baby girl, in which [illegible] of the scenes connected with this. A clearly positive reaction was observed, the cerebro-

psycho-radiant effect subsiding when the subject burst into tears.

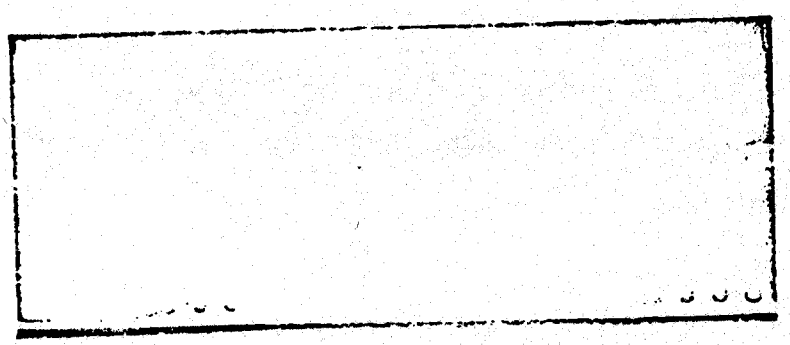


2nd RCPG related to the oneiric recall of her own school days in Luxemburg and particularly of a nun whom she loved dearly.

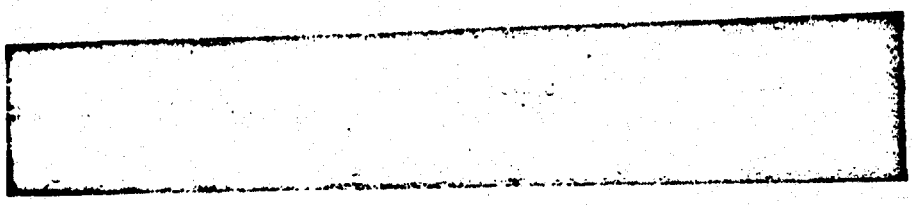


3rd RCPG related to visions in the oneiric state of her two living children.

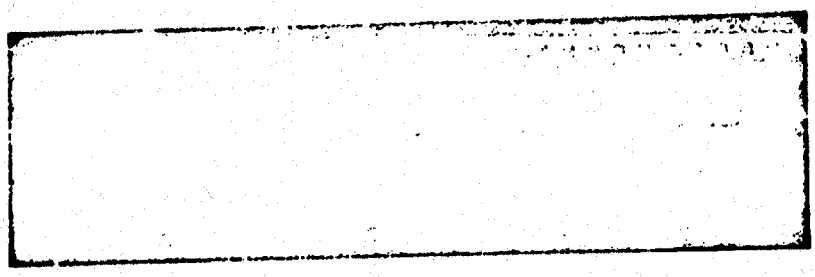
F.M. — Excellent cryptesthetic sensitive subject, chirognome, also hand imprints with positive results controlled by clairvoyance. He was thoroughly studied by Professor Armani and Cazzamalli, who published the results. Doctor Ornella Bacchetta was present at the experiment.



1st RCPG related in the state of slight trance to the examination of the hands of unknown persons, the physical and psychic characteristics coinciding exactly with his findings. Perfect correlation between the pragmatic cryptesthesia and the cerebro-psycho-radiant reaction of the subject.

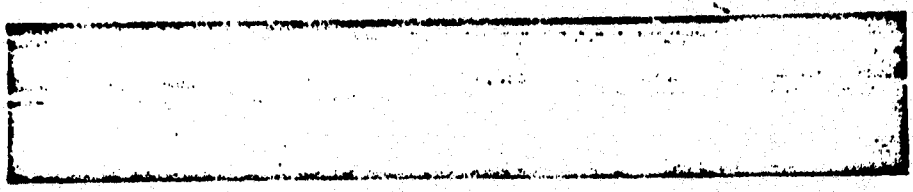


2nd RCPG related to the positive examination of hand imprints of unknown persons with exact identification of the physical and psychic characteristics and of a malady from which they were currently suffering.

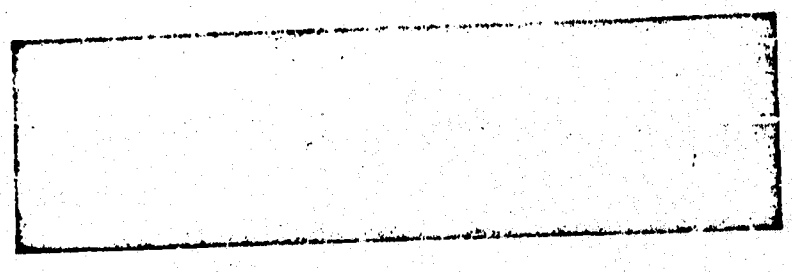


3rd RCPG related to a very lively visual almost hallucinatory recall with the subject in an oneiric state with his eyes closed, of a scene related to a psychic trauma which the subject suffered when he was 20 years old. Quite positive cerebro-psycho-radiant reaction with strict psychophysical correlation.

R.T. — Typically sensitive subject (the mother even fell into medium-like trance) with true dreams of the monitory and premonitory type and telepsychic phenomena in the waking state, both monitory and premonitory of facts which later occurred (for example, he had seen the wheels of an automobile drawing up nails, causing the car to stop suddenly, and thus it happened; then while in a street car, he felt a voice telling him "get down," he followed this impulse, and a few minutes later, the street car was involved in a collision; etc., etc.). The subject studied drafting, and in his normal state does only drafting. For some time now, when he is in slight trance, he draws automatically with extremely rapid gestures; he makes interesting and rather significant drawings of a transcendental nature.

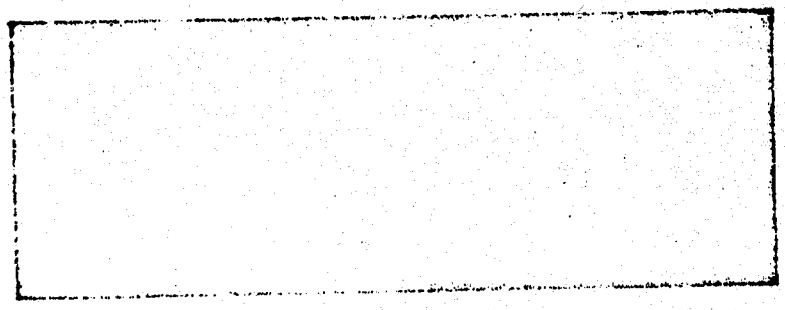


1st RCPG related to drawings made in the stateof slight trance with a drawing pencil on a sheet of paper. Intense cerebro-psycho-radiant reaction and precise psycho-physical correlation.

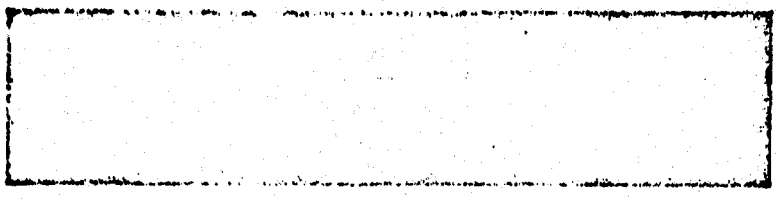


2nd RCPG related to the drawing of a human head resembling the head of Socrates, drawn on the reverse side of the paper. Intense cerebro-psycho-radiant reaction and exact psycho-physical correlation.

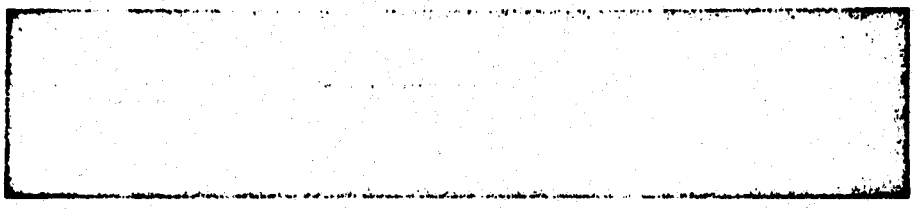
G.P. Sensitive subject gifted with intense visual psychosensoriality, introduced to me by Doctor Elodia Castol de Benavides who was present at the experiment.



1st RCPG related to a state of slight trance during which there occurred visions, with eyes closed, of cinematographic type, of a young doctor dissecting a cadaver.

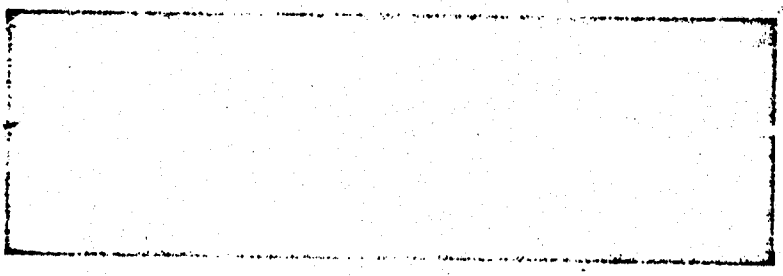


2nd RCPG related to successful cryptesthesia on the handwriting of persons unknown to the subject with identification of physical and psychic characteristics and facts which had occurred.



3rd RCPG related to very lively wandering visions of the almost hallucinatory, cinematographic type in the state of slight trance with positive cerebro-psycho-radiant reaction and exact psycho-physical correlation.

G.U. — Sensitive subject using a pendulum, radiesthesia, sensitive mother.



RCPG related to pragmatic cryptesthesia using photographs of persons unknown to him with clearly positive cerebro-psycho-radiant reaction and exact psychophysical correlation.

R.R. — Cryptesthetic sensitive subject with premonitions of facts later verified from 7-8 years old, particularly in dreams.

RCPG related to pragmatic [illegible] belonging to persons unknown to the [illegible] identification of the character,

physical constitution, diseases from which they were currently suffering, and events which occurred. Cerebro-psychoradiant reaction intense, and psychophysical correlation, perfect.

GENERAL AND PARTICULAR CONSIDERATIONS

Amplitude and Form of the RCPG

If we now consider the RCPG as a whole, their variety impresses us immediately along with some of their particular characteristics. It must be mentioned that the form of the oscillogram is for the most part quite dependent upon the intensity and abruptness of the initial impulse received by the vibrating string in relation to the variation in the state of equilibrium of the receiving unit, which gives the effect of an oscillation of disturbance coming from the brain of the subject.

The amount of tension on the string, which affects the intensity of the reaction, also contributes to the form which the oscillogram will take.

But if the tension is regulated at the beginning of each group of experiments and is only repeated in case of an accident (if the string breaks or if the glass plate falls, etc.). (We have managed to run experiments for a year or more without touching the string after it had once been adjusted) then this coefficient can be neglected.

Thus we can state that the RCPG owes its form above all to the nature of the impulse, nature which must be dependent upon qualitative and quantitative elements of the oscillation or disturbance which come from the source (human brain) and which vary in relation to the psychosensory phenomena.

It is also true that the acoustic reactions heard on the earphones related to the various psychosensory phenomena which we are seeking out, are not equal in character, but vary notably in intensity and nature, going from dry signals to quiet little impulses like telegraph signals, to ructling, to a simple or sonorous hiss, and in rare cases

to whistling notes.

Therefore the amplitude of the RCPG must be dependent upon the intensity of the cerebro-radiant phenomenon, and its form and modality must be related to specific psychophysical qualities of this phenomenon.

With a cathode ray oscillograph, absolutely free of inertia, and with a rather rapid film transport speed, with abundant use of film, and with a conveniently located switch, one could make the cinematographic test correspond to the varied physical conditions of the cerebro-radiant phenomenon, as closely as is inherently possible.

I used the cathode ray oscillograph in this type of experiment from 1932 to 1937 but I did not use film for recording because a very rapid transport speed is necessary for a clear oscillogram.

We have already been able to see the difference, both from acoustic evaluation and with the RCPG, between the electromagnetic reaction of radiation caused by psychic stimuli of psychosensory emotion, whence the cerebro-psycho-radiant reflex, and that reaction arising spontaneously during the psychosensory phenomena of oneirism, pathological hallucination and telepsychism.

In the first case a dry blow is heard on the earphones, and its graphic expression is typical enough on the film; in the second case, we hear hisses of varying intensity, frequency and concrity, whose graphic expression on the film section is again particular.

Duration of the RCPG and of the Various Cerebro-Radiant Impulses

I have been able to calculate approximately the time between one impulse and another, and the duration of the succession of some cerebro-radiant impulses in seconds from reading the film.

The reading of the film permits one to calculate the time which elapses between one electromagnetic reaction of radiation, which we can call briefly cerebro-radiant impulse, and another, since the microwave

system returns to a state of equilibrium between the two impulses, the regular electronic static returns to the earphones, and the horizontal uninterrupted line returns to the film.

The time of succession, then, between one cerebro-radiant impulse and the next on the film, while the whole oneiric, hallucinatory or telepsychic phenomenon runs itself out goes from about 3/10 of a second to 2, 3, 5, 17, 22, up to 28 seconds. The time which elapses between the beginning of a strong impulse (hiss on the earphones) and the extinction of the vibrations in the string averages 2 seconds.

The RCPG of sensitive subjects merits particular attention in relation to the cerebro-psycho-radiant reflex, since one can calculate which of these reflexes are caused by psychic and physical stimuli (being suddenly asked to identify water or minerals underground, objects in closed boxes, writings in envelopes, when the object stimulus is not put into direct contact with the subject).

There is in fact psychophysical explanation for the similarity between the graphic expressions of the RCPG of normal subjects with intense almost hallucinatory oneirism, and pathological subjects in telepsychic and hallucinatory psychosensory excitation, since their state of <u>trance</u> can be reduced to the almost hallucinatory oneirism of the normal subjects.

The impulse time can be considered instantaneous especially because of the electromagnetic nature of the phenomenon, and we can deduce, as we have already done for the cerebro-psycho-radiant phenomenon, <u>that the rate of the intracerebral nerve process, through the psychic ... must be comparable to the velocity of light</u>, simple electrons being involved in both cases.

SOURCE OF THE PHENOMENA: THE BRAIN

I shall only say a few words here about the brain as the undoubted source of electromagnetic phenomena radiating from the human subject in strict correlation to intense psychosensorial activity, since the demonstration has been given in my preceding publications.

Since the functional, organic substratum of psychosensorial activity is the brain, there is no doubt that one must look for the source of electromagnetic phenomena radiating in correlation to psychosensory phenomena, in the brain.

I have already stated and demonstrated that the psychic and neuro-organic reflexes which condition or accompany divining activity, we might say of sensitivity in general, have their anatomic-functional locus in certain cerebral reflexes.

All the other hypotheses of an extra-cerebral locus (bone marrow, heart, muscle, etc.) of electromagnetic phenomena, recorded in relation to states of intense psychosensorial activity, are therefore logically disproven. It is in the brain that we must seek to pin-point the source of the phenomena radiating from the human subject in these afore-described conditions of psychosensory excitation. One cannot think about dreams, dream-states (composed mainly of visual images) of visual hallucination or of any other visual psycho-sensory phenomenon, without having present in mind the picture of the cerebral cortex and particularly the convex surface of the two occipital lobes, locus of mental images.

This may also be said of the psychic and metapsychic manifestations of sensitive subjects, for whom the involvement of the psychosensory cerebral centers is evident.

HYPOTHESES ON THE ESSENCE OF CEREBRORADIANT ELECTROMAGNETIC PHENOMENA AND ON THE PSYCHOBIOPHYSICAL DYNAMISM OF THEIR PRODUCTION

One physical concept which we can formulate about these cerebroradiant electromagnetic phenomena, is, I still maintain, that we are dealing with damped waves, in all probability, which follow variable laws. Perhaps they are trains of waves of differing wavelengths, detectable by a microwave receiver. In a state of intense psychosensorial activity, the brain could very well produce damped electromagnetic oscillations of transitory character. There would then be an abrupt whiplash-like discharge in the ether, such that the receiver could detect impulses at frequencies quite different from those for which it is tuned.

More research is required if we are to determine to some degree of approximation, the scale of frequencies for which cerebral activity (psychosensory) is more intense, and if we are to determine the character of these oscillations.

This is the place where, as I said earlier, one of the capital points of my research in cerebral psychobiophysics is thrown into perspective.

Between the corticocerebral centers, locus of psychosensorial activity, the emanation circuits, consisting of large association bands, and the electromagnetic phenomena radiating from the brain in moments of intense psychosensorial activity, the relationship is one of such strict interdependence in functional activity, that one can make a well-founded interpretation of the probable physical dynamism, electric and electromagnetic, which is involved.

There is first of all a biological fact which must be borne in mind because of its great physical importance, that is the enormous volume of cerebral nervous elements and of the vast number, calculated

to be up to 14 billion – of cortical cells, evidently related to the complex and still unknown electrical activity of the nerve cell.

There is another anatomic-physicological fact; those large association bundles that connect the various psychosensory cortical centers together, to the frontal lobe and to all the other parts of the brain cover, without counting the sub-cortical projections, constitute, together with the commissural fibers, actual circuits through which electric current flows.

From the anatomic-structural point of view, we know the association fibers which put the rather distant cortical regions into relation with the cerebral hemisphere itself: the arcuate fibers, which connect the cortex of one convolution to the cortex of a nearby convolution; the cingulum, which joins the frontal lobe to the anterior part of the temporoocipital lobe; the superior longitudinal and occipitofrontal fasciculi, which join the cortex of the frontal lobe to the cortex of the occipital and temporal lobes; the inferior longitudinal fasciculus, which goes from the frontal lobe to the apex of the temporal lobe; and similarly with the commissural fibers which cross the median plane and terminate at the two extremities in regions analogous to the cortex of the two hemispheres. Let us also mention the projection fibers comprising all those which unite the cerebral cortex to the diverse formations of grey matter underneath.

They are the excitation potentials present in living matter which condition the development of physical phenomena in biological action and which generate the action currents. Now we know that an electromotive force applied to the extremity of a conductor causes oscillations which are propagated from one pole to the other until their extinction, and which radiate into the ether.

To explain radiation of the electromagnetic phenomena of the brain into the ether under certain conditions of psychic activity, we can consider the brain (and the cerebral cortex and the psychosensory cortical centers in particular) as a generator of an electric impulse, which is propagated along the conductors, the large association bundles, thus causing an electromagnetic radiation.

We shall fix our attention on some intracerebral circuits that are energy conductors (Fig. 31): the superior longitudinal fasciculus, which joins the cortex of the occipital lobe to the cortex of the frontal lobe; the occipitofrontal fasciculus, which joins the frontal lobe to the temporooccipital lobe; the uncinate fasciculus, which joins the orbital lobe to the temporal lobe; the arcuate bundles, which join the cortex of adjacent convolutions, and, finally, the commissural fibers and projection fibers.

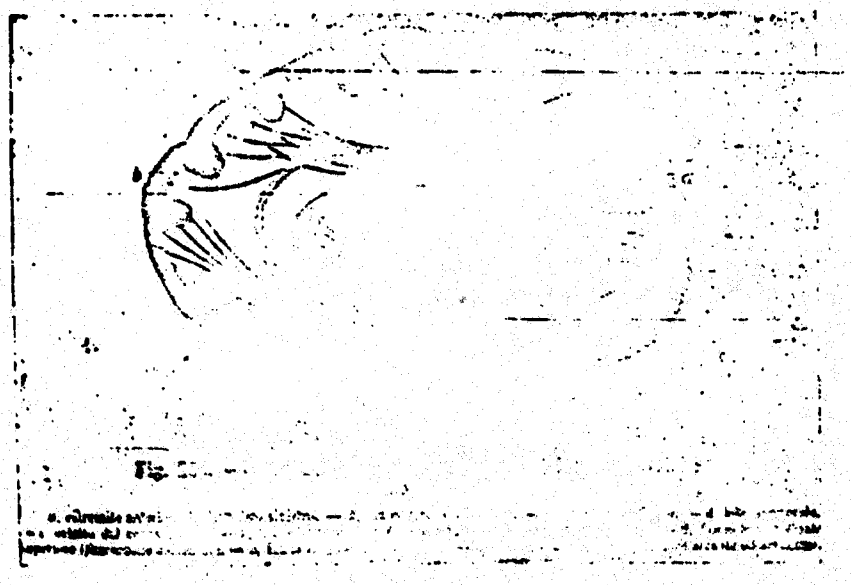


Fig. 31. Fig. 296. — Diagram of the intrahemispheric connecting fibers (according to Meynert). a) Anterior extremity of the left hemisphere; b) its posterior extremity; c) fissure of sylvius; d) temporal lobe; e) margin of the corpus callosum. 1) Longitudinal fasciculus of the limbic concircumvolution (cingulum); 2) superior longitudinal fasciculus (fasciculus arcuatus); 3) inferior longitudinal fasciculus; 4) unciform fasciculus; 5) arcuate fibers.

One must take particular note of the optical path: this pathway goes from the retina – actually a projection of the brain toward the external environment – via the optic nerve, the chiasm, the optic tract and optic radiations to the medial region of the occipital lobe, the cortical center of vision (Fig. 32).

If we consider the length of the conduction path, from the occipital lobe to the retina, we see that it is about 15 cm. Now the electromotive force which travels through this conductor, about 15 cm long, causes it to vibrate in half-waves, giving us 15·2 = 30 cm for the wavelength λ; or it can vibrate in a quarter-wave, which gives us λ = 15 cm × × 4 = 60. Though this be hypothetical (and the calculation be approximate) we can envisage the possibility of similar λ for cerebral electromagnetic phenomena of radiation and thus that they can be detected by ultrashort and microwave receivers. If one repeats this calculation for the conduction path from the ear to the temporal lobe, occipital lobe to frontal lobe, lobes of one hemisphere to lobes of the other hemisphere or the cerebral lobes to the cerebellum, bulb, etc., one always obtains a conduction length of about 5-10-15 cm and therefore 10-20-30-60 cm for λ.

If we call upon the large sympathetic nervous system, we see for example, that the conductive line from the brain to the solar plexus is about 50 cm long, which means that the vibrations in half-waves would be λ = 50 cm × 2 = 1 m, or, in quarter-waves, λ = 50 cm × 4 = 2 m. But it must be added that the conduction length has no relation to the λ radiated, but is independent, so that we can say that if the brain generates a λ x, the vibrations are propagated independently of the length of its line of conduction.

We are therefore faced with a <u>vast intra-cerebral network of nervous energy conductivity</u> which cerebral biophysical research (the re-

sults of my research in 1925 and afterwards, on the electromagnetic phenomena radiating from the human brain were indirectly confirmed by Berger and Adrian's research on variations in electric potential of the human cerebral cortex from 1929 on) has now identified and specified as electrical energy.

These variations in electric potential of the human cerebral cortex can be considered as the first condition for the formation of impulses which in given conditions and in a particular intensity can cause electromagnetic phenomena to radiate from the human brain.

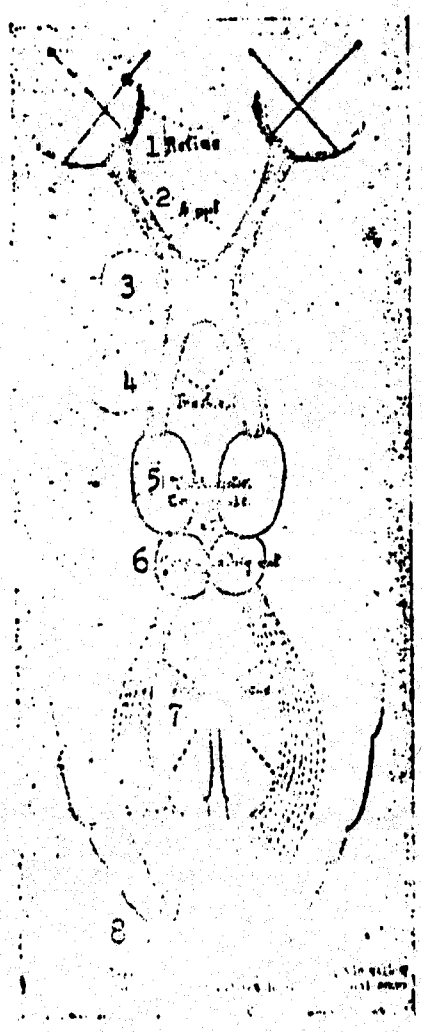


Fig. 32. Fig. 23. Graphic representation of the optic conduction path (the distances between different parts are schematic). 1) Retina; 2) optic nerve; 3) chiasm; 4) optic tracts; 5) optic thalamus and lateral geniculate bodies; 6) corpus quadrigeminum anteriore; 7) optic radiation; 8) occipital lobe.

Now, if we think about the charge of energy in the cerebral sensory centers, particularly the visual centers, during the functional excitation of dreams, dream states, spontaneous or provoked hallucination, we are led to believe that electrical impulses applied to the extremity of theconductors can cause oscillations and therefore generation of electromagnetic waves.

It is therefore a cerebropsychic electric and electromagnetic dynamism which is becoming clearer; the degree of possibility of detection must be accomodated to the functional intensity of the cerebropsychic phenomena.

CEREBRORADIANT ELECTROMAGNETIC DYNAMISM AND THE COSMIC ETHER

Inductions

The chief experimental result of the experiments which I performed on normal subjects gifted with intense psychosensory vivacity (oneiric) on psychopaths (hallucinatory) and on telepsychists (sensitives) in the state of slight trance is the discovery, detection and recording of electromagnetic phenomena radiating from the human brain relative to conditions of excitation of the psychosensory centers.

I have said that it is extremely difficult, nay almost impossible to detect electromagnetic phenomena radiating from subjects who are psychosensorially almost totally tranquil, either because of momentary circumstances or by nature. The only regularly tranquil subjects in the pathologic group were the mentally deficient and the demented: evidently the psychosensory activity of such subjects has been reduced to a minimum either by birth or by some morbidity. Nor is it remarkable to find that psychosensory vivacity is the basis of intelligence, brilliance and genius.

Ceni, through forty years of research on cerebropsychic and cerebro-visceral reactions, was able to show that deaf and blind animals

were as psychically arid as though affected by psychosensory trauma, comparable to a true dementia not unlike that which follows cerebral mutiliations.

This authoritative scientist confirmed the functional dignity of the psychosensory cerebral zone, which I have maintained for over thirty years against the theses and hypotheses held by a conspicuous troop of Italian psychopathologists, ensnared in the nets of a school of fine reputation but which is petrified in error on this particular question.

For the sensitive subjects, the state of slight trance, reducible to a dream state during which the subject's psychosensoriality is impregnated with external reality outside the reach of the senses as they commonly function, and the related electromagnetic phenomena of radiation, suggest some considerations and a well founded interpretative hypothesis that a cerebral psychobiophysical dynamism is involved.

Let me add that in normal or pathological subjects gifted with lively psychosensorial activity, in well water diviners, and in sensitives in general, it is possible to provoke that particular reaction — which I have called the cerebro-psycho-radiant reflex — by means of an adequately strong and sudden stimulus, such as the injunction in the first case to think about persons of major emotional significance to the subject, in the second case to search for water, metals, etc., and in the third case, putting into the hands of the sensitive subject, closed boxes, envelopes, etc., and asking him to describe the sensations, perceptions or ideative complexes which came into his consciousness.

The reflex has turned out to be the common denominator of the three psychic and metapsychic states recorded, and assumes the character of a test of their cerebral locus, with specific reference to the psychosensory centers and to their conduction paths.

Hypotheses

Now let us look at the hypotheses which the experimental data suggest concerning cerebral electromagnetic dynamism in relation to the sensitive subject's becoming conscious of environmental reality in conditions in which the sense organs do not perceive in their habitual function.

Until today, all those working on well diviners or sensitives have spoken of a "special sensitivity" with which these subjects are gifted and which renders them "sensitive," in modern physical language, to radiations coming from water, from stratified minerals, from objects, handwritings, etc.

These subjects are then like sensitive instruments which, struck by specific waves, vibrate in resonance with the sudden excitation.

This induction of mine which is drawn from experimental observation, comes from my research in psychobiophysics on electromagnetic phenomena radiating from the brain; it overthrows the terms of the problem completely.

The diviner or the sensitive subject in general is not a passive instrument, but is active.

This is evident from the psychological point of view, so I have called it the state of expectant attention (slight trance), and I have called the diviner (and this is also true of the sensitive when he begins to search) a subject in action.

If one watches the psychic mimicry and neuropsychic reactions of diviners and sensitives in action, one will be able to identify exactly the state of neuropsychic excitation of these subjects in action (which is succeeded sooner or later by a subsiding through physiopsychic fatigue) and to perceive the psychological elements, unexpressed but evident, of interrogation and waiting in respect to the terrain to

be "explored," or the persons, objects or handwritings to "inquire about."

In sum, we have here a series of psychosensory questions and answers which follow the laws of excitation of neuropsychic reaction. In other words, the psychosensory centers of the brain being in excitation, are thus run through with electric current with radiating effects; thus the brain can be put directly into contact with physical external reality which would ordinarily remain inaccessible to the external senses.

We also have cases in which the stimulus seems to have to hit the subject without warning, thus giving the impression that in these conditions the cerebropsychic reaction can be of a passive type.

I am referring to unforeseen sensations, for example in well diviners, of there being water underground, when they are simply going down streets without intending to explore them for water. This also happens with cryptesthesia or accidental telepathy with subjects in the waking state or in sleep (in the latter case the dream is the vector).

Now it is particularly interesting that this activity manifests itself when the doors of the senses are closed or semiclosed to the outside world. Thus there seems to be on the one hand a high potential of charge on the psychosensory cortical centers, and on the other the exceptional substitution of the sensory path way with a direct action of the psychosensory centers of the brain.

If we observe attentively the characteristics of the psychic state in which such subjects are found when the unforeseen sensation of the presence of water, or of the situation of far away persons, in danger or dying (with later precise confirmation of the fact) comes into their consciousness, we will see that the well diviner while walking along, was at a given moment in a psychic state of dream, of fantasy, cut off, at least in part, from the environment, and so the sensitive

of a far away fact, is at that moment in a state of reverie, that is cut off from the influence of his sensory surroundings. One example is the rather frequent case of a mother who while sewing (an almost automatic activity which allows the woman to give full vent to fantasy) has an unforeseen sensation that her son is in danger, or that something has happened to him; it is enough to think about the numerous verified telepathic facts which strike some subjects in the dreams during sleep to be convinced that even in cases of apparent passivity, we are still dealing with a psychic or dreaming state, or an actual dream, psychic state which has its cerebral equivalent in the organ of the psychosensory centers and in the related electromagnetic impulses with radiant effects.

In other words, some conditions of apparent passivity of human psychism correspond in reality to a state of intense cerebral activity, consisting precisely of excitation of the psychosensory centers.

At this point, I believe I can express my opinion about the telepsychism of the well diviners in action and about sensitives in general relative to the probable psychophysical conditions for cerebral activity. From the results of my experimental psychobiophysical research, it seems that the brain radiates electromagnetic phenomena during intense psychosensorial activity. I have said that one can think of the impregnated cortical mass as the source of the electromotive force which is applied to the end of the conductors, the large association bands, the optic path, etc., which acquire here the value of radiating conductors.

Let us now look at what happens to the diviner in action, as an example.

We have seen that the stateof slight trance of diviners (and this may also be said of sensitives) is physically conditioned by electromagnetic phenomena radiating from the brain. Thus they – the induction

is valid – can direct themselves to the mass of water, metal, etc. Two conditions are met in these cases: in the first case, electromagnetic waves generated by the brain, coming into contact with the mass X can generate in this mass electrical oscillations which can be reradiated in part and therefore detected by the subject; in the second case, the X can generate electromagnetic waves and give a secondary emission, which reaching the subject, will be detected by him.

This state of electromagnetic dynamism must correspond to a change in the state of consciousness, or to the introduction into the consciousness (including the subconscious) of an impression which finally reaches the threshold of waking consciousness.

The movements of the rod, the pendulum, and all the other neuromotor neurosenitive, neurovascular reflexes, etc., consitute the somatic detection of the afore-mentioned variations in energy of electromagnetic order.

All this may be adapted perfectly to telepsychic phenomena, particularly to well divining and to pragmatic cryptesthesia, which we see to be similar if we substitute a person or an object, a sample of hand writing, etc., for the water or minerals to be explored by the sensitive.

Well divining, pragmatic cryptesthesia, telepsychism in general then can be identified by the electromagnetic phenomenology radiating from the human brain, or at least this latter appears as a necessary condition for the metapsychic dynamism of well divining, cryptesthesia and telepsychism.

One of the most important consequences of the discovery of electromagnetic phenomena radiating fromthe human brain in functional psychosensory excitation, is that we must now think of the brain, not only as a recorder of vibrations, which reach it from the outside, but as a transmitter-receiver oscillator radiating in the aether, with explora-

tive possibilities for these vibrations which constitute an ocean in which we are immersed.

While as a rule, the perception of facts comes through the induction into the brain of sensations gathered and conveyed by the senses, (that is the brain in its habitual conditions of activity comes into contact with the outside world through specific sense apparati) in the case of paranormal cognitive perceptions, I maintain that partial or total, more or less perfect knowledge of facts arises in all probability, from the interference of radiations emitted by the brain with those emitted by the objects explored.

In these cases then, there is a direct action, that is a direct contact made by the brain, and specifically by its psychosensory cortical centers with the outside world, that is with the universe of radiations.

I admit that this is only a hypothesis, and no more, but it is derived from experimental data by logical deduction-induction. Further knowledge will either confirm or destroy it.

However, we do have a new orientation for experimental research in psychobiophysics, with new possibilities for exploration in the realm of normal and pathological human psychism, not only in metapsychics.

CONCLUSIONS

Electromagnetic phenomena radiate from the human brain during intense psychosensory activity under conditions of total or partial closure of the doors to the outside world which raises the potential for electric charge on the psychosensory cortical centers, with electromagnetic effects of radiation. Thus the high dignity of function of the sensory cortical centers is restored to the cerebral concepts of human psychism. The electromagnetic dynamism with which the brain has been

shown to be gifted, appears as a physical phenomenon of psychosensoriality and in a certain sense even of human thought.

2. The large association bands and the large intracerebral conduction paths probably assume the characteristics of radiating conductors, while intracerebral nervous energy must assume an electrical nature with electromagnetic effects, and the velocity of nervous conduction in the psychic intracerebral arc must be close to the velocity of light (300,000 kilometers per second).

3. The cerebropsychoradiant or rather psychobiological reflex, since it is a cerebral electromagnetic effect, indicates the possibility of a direct physical relation between the brain and the cosmic ether. The human brain, therefore, can no longer be considered simply as a receiver of vibrations which come to it from the ether environment along the sensory path, but as an active organ, that is in direct form through the intermediary of the sense organs, radiating and exploring the universe of vibrations. The direct contact made by the psychosensory cerebral centers with the universe of radiations makes it physically possible for both man and, as we may safely assume, the animals, to have the remarkable, so-called metapsychic power of knowledge of the outside world.

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[Footnotes]

195 I must mention the inestimable collaboration of the doctor of engineering Eugenio Gnesutta, in this new experimental phase which includes the group of experiments performed from 1941 to 1954; as in the prior phases, I owe to him the drawings for the construction of the radioelectric apparati; I must also mention the diligent and able collaboration of Mr. Ferdinando Rosa who worked under the guidance and direction of the engineer Gnesutta. To the memory of my great and tireless collaborator, Mr. Rosa, recently and prematurely deceased, g o my warmest thoughts of affectionate esteem and gratitude.