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NATIONAL SECURITY AGENCY
CENTRAL SECURITY SERVICE
FORT GEORGE G. MEADE, MARYLAND 20755-6000

FOIA Case: 78752A
5 September 2014

JOHN GREENEWALD

[REDACTED]
[REDACTED]

Dear Mr. Greenewald:

This is our final response to your Freedom of Information Act (FOIA) request of 4 August 2014 for Intellipedia entries for "ZERO POINT ENERGY." As stated in our initial response letter, dated 6 August 2014, your request was assigned Case Number 78752. A copy of your request is enclosed. For purposes of this request and based on the information you provided in your letter, you are considered an "all other" requester. As such, you are allowed 2 hours of search and the duplication of 100 pages at no cost. There are no assessable fees for this request. Your request has been processed under the FOIA.

For your information, NSA provides a service of common concern for the Intelligence Community (IC) by serving as the executive agent for Intellipedia. As such, NSA provides technical services that enable users to access and share information with peers and stakeholders across the IC and DoD. Intellipedia pages are living documents that may be originated by any user organization, and any user organization may contribute to or edit pages after their origination. Intellipedia pages should not be considered the final, coordinated position of the IC on any particular subject. The views and opinions of authors do not necessarily state or reflect those of the U.S. Government.

We conducted a search of all three levels of Intellipedia for "Zero Point Energy" and located one document that is responsive to your request. The responsive document is enclosed. Certain information, however, has been deleted from the enclosure

This Agency is authorized by statute to protect certain information concerning its activities (in this case, internal URLs), as well as the names of its employees. Such information is exempt from disclosure pursuant to the third exemption of the FOIA, which provides for the withholding of information specifically protected from disclosure by statute. The specific statute

applicable in this case is Section 6, Public Law 86-36 (50 U.S. Code 3605). We have determined that such information exists in these records, and we have excised it accordingly.

In addition, personal information regarding individuals has been deleted from the enclosure in accordance with 5 U.S.C. 552 (b)(6). This exemption protects from disclosure information that would constitute a clearly unwarranted invasion of personal privacy. In balancing the public interest for the information you request against the privacy interests involved, we have determined that the privacy interests sufficiently satisfy the requirements for the application of the (b)(6) exemption.

The Initial Denial Authority for NSA information is the Associate Director for Policy and Records, David J. Sherman. Since these deletions may be construed as a partial denial of your request, you are hereby advised of this Agency's appeal procedures. Any person denied access to information may file an appeal to the NSA/CSS Freedom of Information Act Appeal Authority. The appeal must be postmarked no later than 60 calendar days from the date of the initial denial letter. The appeal shall be in writing addressed to the NSA/CSS FOIA Appeal Authority (DJ4), National Security Agency, 9800 Savage Road STE 6248, Fort George G. Meade, MD 20755-6248. The appeal shall reference the initial denial of access and shall contain, in sufficient detail and particularity, the grounds upon which the requester believes release of the information is required. The NSA/CSS Appeal Authority will endeavor to respond to the appeal within 20 working days after receipt, absent any unusual circumstances.

Sincerely,

A handwritten signature in black ink, appearing to read "Pamela N. Phillips". The signature is fluid and cursive, with the first name being the most prominent.

PAMELA N. PHILLIPS
Chief
FOIA/PA Office

Encls:
a/s

Archer, Lynn M

From: donotreply@nsa.gov
Sent: Monday, August 04, 2014 10:54 PM
To: donotreply@nsa.gov
Cc: john@greenewald.com
Subject: FOIA Request (Web form submission)

Name: John Greenewald

Email: john@greenewald.com

Company: The Black Vault

Postal Address: [REDACTED]

Postal 2nd Line: None

Postal City: Northridge

Postal State-prov: California

Zip Code: 91325

Country: United States of America

Home Phone: [REDACTED]

Work Phone: [REDACTED]

Records Requested: To whom it may concern,

This is a non-commercial request made under the provisions of the Freedom of Information Act 5 U.S.C. S 552. My FOIA requester status as a "representative of the news media" however due to your agency's denial of this status, I hereby submit this request as an "All other" requester.

I prefer electronic delivery of the requested material either via email to john@greenewald.com or via CD-ROM or DVD via postal mail. Please contact me should this FOIA request should incur a charge.

I respectfully request a copy of the Intellipedia entry (from all three wikis that make up the Intellipedia) for the following entry(s) (Or whatever similar topic may pertain if it is slightly worded differently):

ZERO POINT ENERGY

Thank you so much for your time, and I am very much looking forward to your response.

Sincerely,

John Greenewald, Jr.
[REDACTED]

(U) Zero-point energy

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From Intellipedia



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Intellipedians are asked to help link it into Intellipedia in an intelligent way, categorize it, fix transfer errors, review for accuracy, and add classified information as appropriate. Remove this template when it is felt the assimilation is complete.

In physics, the **zero-point energy** is the lowest possible energy that a quantum mechanical physical system may possess; it is the energy of the ground state of the system. All quantum mechanical systems have a zero point energy. The term arises commonly in reference to the ground state of the quantum harmonic oscillator. In quantum field theory, it is a synonym for the vacuum energy, an amount of energy associated with the vacuum of empty space. In cosmology, the vacuum energy is taken to be the origin of the cosmological constant. Experimentally, the zero-point energy of the vacuum leads directly to the Casimir effect, and is directly observable in nanoscale devices.

Because zero point energy is the lowest possible energy a system can have, this energy cannot be removed from the system.

Despite the definition, the concept of zero-point energy, and the hint of a possibility of extracting "free energy" from the vacuum, has attracted the attention of amateur inventors. Numerous perpetual motion and other pseudoscientific devices, often called free energy devices, exploiting the idea, have been proposed. As a result of this activity, and its intriguing theoretical explanation, it has taken on a life of its own in popular culture, appearing in science fiction books, games and movies.

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Foundational physics

Approved for Release by NSA on 08-28-2014, FOIA Case # 78752

In classical physics, the energy of a system is relative, and is defined only in relation to some given state (often called reference state). Typically, one might associate a motionless system with zero energy, although doing so is purely arbitrary.

In quantum physics, it is natural to associate the energy with the expectation value of a certain operator, the Hamiltonian of the system. For almost all quantum-mechanical systems, the lowest possible expectation value that this operator can obtain is not zero; this lowest possible value is called the zero-point energy.

The origin of a minimal energy that isn't zero can be intuitively understood in terms of the Heisenberg uncertainty principle. This principle states that the position and the momentum of a quantum mechanical particle cannot both be known arbitrarily accurately. If the particle is confined to a potential well, then its position is at least partly known: it must be within the well. Thus, one may deduce that within the well, the particle cannot have zero momentum, as otherwise the uncertainty principle would be violated. Because the kinetic energy of a moving particle is proportional to the square of its velocity, it cannot be zero either. This example, however, is not applicable to a free particle - the kinetic energy of which can be zero.

Varieties of zero-point energy

The idea of zero-point energy occurs in a number of situations, and it is important to distinguish these, and note that there are many closely related concepts.

In ordinary quantum mechanics, the zero-point energy is the energy associated with the ground state of the system. The most famous such example is the energy $E = \frac{\hbar\omega}{2}$ associated with the ground state of the quantum harmonic oscillator. More precisely, the zero-point energy is the expectation value of the Hamiltonian of the system.

In quantum field theory, the fabric of space is visualized as consisting of fields, with the field at every point in space and time being a quantized simple harmonic oscillator, with neighboring oscillators interacting. In this case, one has a contribution of $E = \frac{\hbar\omega}{2}$ from every point in space, resulting in a technically infinite zero-point energy. The zero-point energy is again the expectation value of the Hamiltonian; here, however, the phrase vacuum expectation value is more commonly used, and the energy is called the vacuum energy.

In quantum perturbation theory, it is sometimes said that the contribution of one-loop and multi-loop Feynman diagrams to elementary particle propagators are the contribution of vacuum fluctuations or the zero-point energy to the particle masses.

Some have drawn comparisons between the zero-point field and other universal energy field theories such as the akashic field, the aether and other less popular variants.

Other potentials of zero-point energy aside from the "free energy theories" are the idea that interaction with the zero-point field of the vacuum may produce propulsive effects, that would not be free energy just a new and perhaps more efficient form of propulsion. Groups such as NASA [1] (http://www.nasa.gov/centers/glenn/research/warp/possible_prt.htm) and British Aerospace have been looking into this idea. As of yet, there is no known way to interact with the vacuum in this way, but they do have a few theories that may warrant investigation in the future. They entitle these theories "Hypothetical space drives".[2] (<http://www.nasa.gov/centers/glenn/research/warp/ideachev.html>)

Experimental evidence

The simplest experimental evidence for the existence of zero-point energy in quantum field theory is the Casimir effect. This effect was proposed in 1948 by Dutch physicist Hendrik B. G. Casimir, who considered the quantized electromagnetic field between a pair of grounded, neutral metal plates. A small force can be measured between the plates, which is directly ascribable to a change of the zero-point energy of the electromagnetic field between the plates.

Although the Casimir effect at first proved hard to measure, because its effects can be seen only at very small distances, the effect is taking on increasing importance in nanotechnology. Not only is the Casimir effect easily and accurately measured in specially designed nanoscale devices, but it increasingly needs to be taken into account in the design and manufacturing processes of small devices. It can exert significant forces and stress on nanoscale devices, causing them to bend, twist, stick and break.

Other experimental evidence includes spontaneous emissions of light (photons) by atoms and nuclei, observed Lamb shift of positions of energy levels of atoms, anomalous value of electron's gyromagnetic ratio, etc.

Gravitation and cosmology

In cosmology, the zero-point energy offers an intriguing possibility for explaining the speculative positive values of the proposed cosmological constant. In brief, if the energy is "really there", then it should exert a gravitational force. In general relativity, mass and energy are equivalent; either produces a gravitational field.

One obvious difficulty with this association is that the zero-point energy of the vacuum is absurdly large. Naively, it is infinite, but one must argue that new physics takes over at the Planck scale, and so its growth is cut off at that point. Even so, what remains is so large that it would visibly bend space, and thus, there seems to be a contradiction. There is no easy way out, and reconciling the seemingly huge zero-point energy of space with the observed zero or small cosmological constant has become one of the important problems in theoretical physics, and has become a criterion by which to judge a candidate Theory of Everything.

A uniformly accelerating observer will observe zero-point energy of the electromagnetic field as a thermal bath of real photons, in an effect known as the Unruh effect.

Rueda, Haisch and Puthoff (1994 (<http://www.calphysics.org/articles/PRA94.pdf>) , 1998a (<http://xxx.arxiv.org/abs/physics/9802030>) , 1998b (<http://xxx.arxiv.org/abs/physics/9802031>)) have proposed that an accelerated massive object interacts with the zero point field to produced an *electromagnetic drag force* which gives rise to the phenomenon of inertia; see stochastic electrodynamics.

"Free energy" devices

The Casimir effect has established zero point energy as an uncontroversial and scientifically accepted phenomenon. However, the term *zero point energy* has also become associated with a highly controversial area of human endeavour - the design and invention of so-called free energy devices, similar to perpetual motion machines in the past. These devices purport to "tap" the zero-point field and somehow "extract

energy" from it, thus providing an "inexhaustible", cheap, and non-polluting energy source.

Controversy arises when such devices are promoted without scientifically acceptable proof that they tap the energy sources claimed. Promoters of a device demonstrate no understanding of how the device might do so; they demonstrate misunderstanding of widely accepted scientific facts and methods, in development or communication of a theory concerning a device; they make no attempt to include simpler explanations for the claimed performance of a device.

Any of these behaviours are liable to taint the reputations of those involved with such devices, and qualified researchers are therefore likely to be reluctant to make any attempt to verify or even seriously dismiss such a device until its promoters demonstrate enough competence to be taken seriously.

See also

- Quantum harmonic oscillator
- Vacuum energy
- Radiant energy
- Unruh effect
- Zero-point energy in popular culture

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External links

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- Philip Yam, "Exploiting Zero-point Energy (<http://www.padrak.com/ine/ZPESCIAM.html>) ", *Scientific American Magazine*, December 1997, pp. 82-85.
- ZERO.POINT (<http://www.zeropoint.tv>) , sci-fi television series in development about the search for zero-point energy.
- Institute for Advanced Studies at Austin (<http://www.earthtech.org/index.html>) , dedicated primarily to the study of ZPE.
- Zero Point Energy (<http://freeenergynews.com/Directory/ZPE/>) - Claims to working energy technologies that tap the theoretical zero point, theory, resources. (*FreeEnergyNews.com* directory page)
- Bernard Haisch, "Brilliant Disguise: Light, Matter and the Zero-Point Field (http://www.science-spirit.org/article_detail.php?article_id=126) ", *Science & Spirit Magazine*
- The Hunt for Zero Point (http://www.randomhouse.co.uk/minisites/zeropoint/zero_point.html)
- Alokik Kanwal, Zero-point energy (<http://www.eden.rutgers.edu/~alokik/Zero/3D%20Zero-Point%20Energy.PPT>) (Power Point presentation; rutgers.edu)
- Video clip about "Over-Unity". [3] (<http://video.google.com/videoplay?docid=2464139837181538044>)
- The One That Is Both (<http://theonethatisboth.com>) , a novel about the ethics of using zero-point energy (among other things).ar: طاقة النقطة صفر

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nl:Nulpuntenergie pl:Energia punktu zerowego ru:Нулевые колебания zh:零點能量

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