

# ***FUTURE ENERGY***

## ***Annual***

### ***2004***

*featuring*

**Highlights from *Future Energy eNews***

**&**

**IRI Annual Report for 2003**

Thomas Valone, Editor



## **CREDITS**

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*Scientific American*

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## **IRI OFFICERS AND DIRECTORS - 2003**

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## President's Letter

This **Future Energy Annual Report 2004** displays a new, expanded format which IRI is happy to offer as part of our continued effort to generate increased value for your membership dollar. It features the best articles from our widely circulated, monthly *Future Energy eNews* as well as a summary of IRI 2003 activities, ending with the financials. If you are not receiving the *eNews* each month and would like to, please send a short note to [iri@erols.com](mailto:iri@erols.com) to be placed on our list.

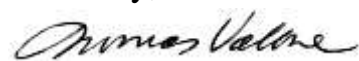
With the launching of the 2003 **Bioelectromagnetics Program**, Integrity Research Institute opened a new chapter for helping people realize how energy can be used in a therapeutic manner. This program has reached a milestone, with a product line called the PREMIER being developed and completed, consultation accomplished, and a new book published on *Bioelectromagnetic Healing*. As Dr. Beverly Rubik says in her endorsement for the book, "Hopefully the next generation of doctors will be using BEM medicine!"

In 2003, the "**Feasibility Study of the Extraction of Zero Point Energy for Useful Work**" was also completed, which also fulfilled a longtime goal of finishing my PhD degree for which almost all of the graduate course work had already been accomplished at the State University of NY at Buffalo. The *Feasibility Study* offers for the first time an engineering approach to a purely physics problem and evaluates the practical opportunities for electrical energy production, which are quite promising.

We were very pleased to host a well-attended **Tesla Energy Science Conference & Exposition in 2003** which celebrated the Centennial of the Wardencllyffe Tower that was completed in 1903. The conference was the first of its kind for IRI as well. One day centered on the wireless transmission of power that Tesla pioneered and the second day was devoted to electromagnetic therapy which Tesla lectured on.

In 2004, IRI has an expanded role to play in defining new energy technologies that are worthy of investment and advancement as a result of building on the success of 2003.

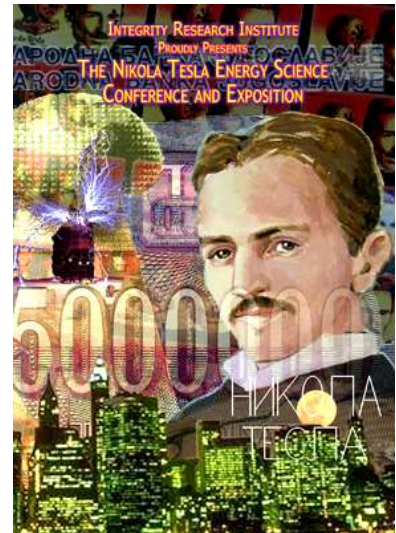
Sincerely,



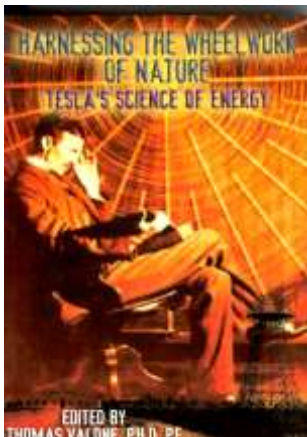
Thomas Valone, PhD  
President

# INTEGRITY RESEARCH INSTITUTE HIGHLIGHTS 2003

- The First Nikola Tesla Energy Science Conference and Exposition** was held November 8 and 9<sup>th</sup>, 2003 at the Sheraton College Park Hotel in the Washington DC metro area. This two-day conference centered on the theme of Tesla’s wireless electricity and bioelectromagnetic healing. With over 300 in attendance, including physicists, engineers, medical professionals and people interested in alternative energy technologies, this conference had groundbreaking presentations by outstanding scientists, including: Dr Paul Werbos, from the National Science Foundation, Dr. Mark Neveu from the National Foundation for Alternative Medicine, President of the Nikola Tesla Memorial Society, William Terbo, closest living relative of Nikola Tesla. Dr James Corum and Kenneth Corum, Dr. Elizabeth Rauscher, Prof. Marc Seifer, Prof Konstantin Meyl, Jeffrey Behary, Ryn Raavis, PT and Ralph Suddath. DVD’s, Videos and tapes of all speakers were available simultaneously at the conference for those interested. Prof Anthony Holland from Skidmore College composed the original musical score “The Tesla Tower” which was played just before the Tesla coil Demonstration. For a detailed summary of the conference, see article in page 11.

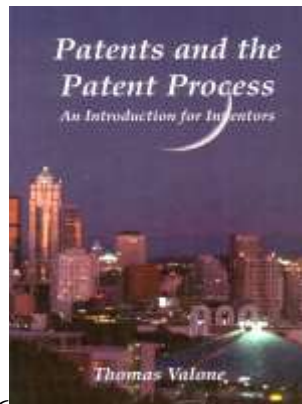


- Harnessing the Wheelwork of Nature** by Thomas Valone, PhD, Adventures Umlim. Press.



For the 2003 Centennial of Tesla’s Wardencllyffe Tower, this book presents the feasibility argument for Tesla’s most ambitious dream, the wireless transmission of power. Pictured on the book’s cover near his feet, the 187-foot Wardencllyffe Tower was Tesla’s means to deliver natural 8 Hz electricity anywhere in the world, by longitudinal waves. Unknown to most electrical engineers, Nikola Tesla’s dream answers the energy crisis worldwide, saves electrical conversion losses, and provides a real alternative to transmission lines. In Dr. Corum’s contributed papers, he explains Tesla’s magnifying transmitter, which Tesla compared to a telescope. Corum points out that “the tuned circuit of his magnifying transmitter was the whole earth-ionosphere cavity resonator”.

- Patents and the Patent Process Book**, by Valone, is another new IRI book published patent examiner and current expert witness Valone shares his valuable insights on how without going through all the red tape. insider’s advice, this book is very popular independent inventors. It has received endorsements, including one from Dr. Hal



Dr. Thomas in 2003. A former consultant, Dr to obtain a patent Packed with an among many Fox, editor of the



- **Bioelectromagnetics Program.** With generous donations from IRI member, Ralph Suddath, a bioelectromagnetic machine was designed and developed by the bioenergy team of IRI in 2003.



The **PREMIER, Photonic Rejuvenation Energizing Machine & Immunizing Electrification Radiator**, is IRI's multiple combination experimental electro-medicine machine. Developed by the bioenergy team, under the direction of Dr Valone, it is based on the Azure patent #6,217,604 "Method for treating diseased states, in particular AIDS, using an electromagnetic generator." This 200 kV machine energizes the body in a very short exposure lasting less than 5 minutes. One can sit in a non-contacting position

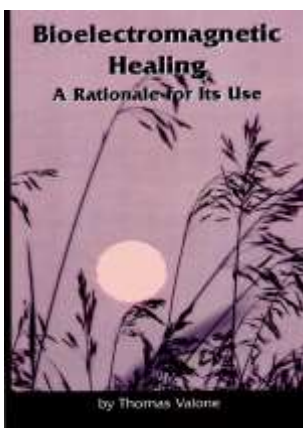
nearby or take advantage of the TouchPad™ and/or Wand to receive antioxidant electrons which studies show will fight free radicals. (Review the Azure patent at [www.uspto.gov](http://www.uspto.gov))

- **Rife Technology Research.** Continuing our research and exploration on all forms of energy, whether in the technical, health or environmental areas, IRI visited *Beam Ray, LLC*, makers of the Beam Ray therapy device, in Alabama. Mr. Lynn Kenny, President of Beam Ray, showed Dr Valone, his laboratory and research on Royal Raymond Rife technology. Beam Ray holds the largest collection of original equipment and archives once owned by Dr. Royal Raymond Rife. He has an IRB from the FDA for clinical studies on their device. Mr. Kenny has also become a generous supporter of IRI's bioenergy program.



From right to left: IRI President, T Valone, Beam Ray President, Lynn Kenny, IRI member, Ralph Suddath and a Beam Ray eng.

- **Bioelectromagnetic Healing: A Rationale for Its Use.** By Thomas Valone, PhD.

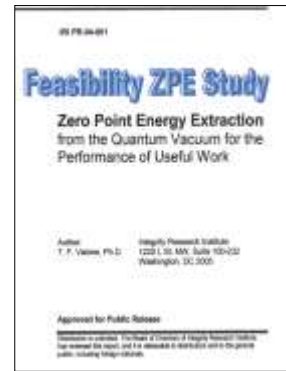


Published in 2003, this is the first book to provide a comprehensive scientific explanation for the reasons why high voltage electrotherapy devices work, including a summary of the new findings of biophotons. It quickly became a bestseller, especially among bioenergy professionals and biophysicists, and has earned endorsements from prominent scientists and researchers including:

*"This is a great [book] that you published...Hopefully the next generation of doctors will be using BEM medicine!"* – Beverly Rubik, PhD - Institute for Frontier Sciences

*"This book has become my bible for BEMS healing information."* Prof. Tania Sawiecki - Penn State University, Materials Science Dept.

- **Zero Point Energy Program.** IRI completed the 250-page “Feasibility Study of Zero Point Energy for the Performance of Useful Work.” As a public service, for the first time, the complete book is available online for FREE. The abbreviated title is “*Feasibility Study of ZPE*”. It has received more than 1000 downloads from our website this year alone. A popular version is being planned for 2005. Also a revised edition of the report: *Zero Point Energy and the Future* was finished in July, including the latest journal papers on ZPE and the quantum vacuum.



- **Future Energy Program.** IRI continued to research and promote



future energy technologies such as: 1) Focus Fusion by Dr Eric Lerner, who was the lead story of our annual *Future Energy Newsletter*; 2) MEC Project of Godin and Roschin; 3) Earthquake Predictor and Triangulator project of Dr. Elizabeth Rauscher and 4) our continued research and study of Permanent Magnetic Motors. This year, our *Future Energy Newsletter* has become an annual magazine available for free to all members of IRI, with their paid membership dues. *Future Energy Enews*, our monthly electronic newsletter, which is distributed free of charge to over 2000 recipients, continued to earn much praise from many other institutions such as The Arlington Institute and the Alternative Energy Institute.

- **Lecture appearances.** IRI officers continued to be very busy in 2003. There were many conference presentations, radio interviews and exhibit booths educating the public and professionals alike, which included: President Valone at the “*Whole Person Healing Conference*” in March 2003 in Bethesda, MD, a conference organized by Penn State University. There were also presentations at the “*USPA Annual Conference*” in Columbus Ohio by IRI Director, Jacqueline Panting Valone, ND and President, Thomas



Valone. Also Dr. Valone was interviewed and filmed for an upcoming “Energy Medicine and Electrotherapy” DVD by *Sota Instruments*. Several radio interviews including one at *Radio London* regarding new energy technologies and possibilities of zero point energy, took place in the Spring of 2003. IRI Director, Wendy Nicholas, presented IRI books and materials at the “First Nikola Tesla Energy Science Conference and Exposition,” and educated attendees on Tesla technologies. Personal interviews with energy staffers were also done this

year. A notable Capitol Hill meeting included President Valone with Senator John Kerry’s energy staffer, Katie Joyce along with a National Science Foundation director, Dr. Paul Werbos, in the Russell Senate Office Bldg, to discuss energy policy and alternative energy possibilities.

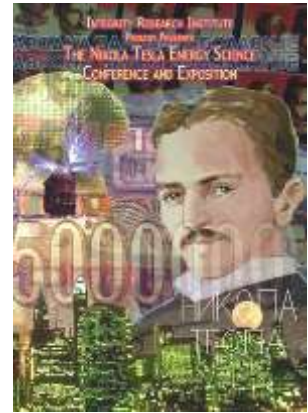




# Review of the First Nikola Tesla Energy Science Conference and Exposition

by Jacqueline Panting, ND

In the spirit of the new millennium and to honor the centennial of Nikola Tesla's futuristic, Wardencllyffe Tower, IRI hosted the "First Nikola Tesla Energy Science Conference and Exposition" on November 8 and 9<sup>th</sup>, 2003. Held at the beautiful College Park Sheraton Hotel, it boasted over 300 attendees, 12 highly accomplished speakers and over 20 exhibitors.



In the welcoming address, IRI President **Dr. Thomas Valone**, gave praises to the great inventor, Nikola Tesla, who not only invented energy generation solutions, but also high voltage electromagnetic healing devices. Tesla's biggest dream, the Wardencllyffe Tower, promised the world cheap energy 100 years ago in 1903, but after losing his financial support, was unable to see this dream realized. With some of the world's most forward-looking researchers and

scientists to come and tantalize the audience, he introduced the first speaker, **Dr Paul Werbos**, Director of Electrical Communications at the National Science Foundation. He gave a dynamic presentation on energy issues facing the World from a United Nations perspective and how space solar power is a possible long-term sustainability solution.



The next speakers, **James Corum, PhD.** and **Kenneth Corum**, who are the authority on Tesla's wireless power transmissions, and highly respected in all scientific circles They have worked for DARPA, DOD, DOE, Navy, Army and many others. Together they spoke on the complexities of wireless power transmission and how the Earth must be part of a resonant system to achieve efficient power transmission on a large scale. He showed how Tesla had actually patented the Earth as part of the

Wardencllyffe project.

**Prof. Konstantin Meyl**, from Germany, gave a lesson on Scalar wave theory and a demonstration of wireless transmission. His theory favors Faraday's findings over some key assumptions made by Maxwell in ignoring magnetic and electric potentials. The theory reduces to Maxwell if the evidence of magnetic or electric potentials are truly zero. Since the energy transfer interacts with the Earth, there are reports of receiver gains of 2 to 3 times the transmitted power and it is felt that this is charge and ionic energy entrained from the atmosphere. He discussed also the instability as atmospheric potentials vary with weather. Nonetheless, as the recent solar flares showed, the ionosphere is a powerhouse of energy and if this is a method to interface with the ionosphere, it is a powerful source of sustainable energy. Good atmospheric coupling may require large towers as Tesla attempted at Wardencllyffe and in Colorado.



**Dr. Elizabeth Rauscher** gave a presentation on using the ionosphere for wireless power based on her experience with the development of the ELF for Earthquake [prediction] detection and triangulation. Dr. Rauscher, a pioneer for all women scientists, was one of the first women to ever receive a PHD in Nuclear and Astrophysics from UC at Berkeley. She is an inspiration to all of us with her outstanding achievements, her wonderful sense of humor and years of dedication to the emerging energy field. We were honored to have her at our conference.



Our Saturday evening Special Event and Reception, included the viewing of the BBC production of “Masters of the Ionosphere”, a HAARP technology video, which was kindly provided by Mr. William Terbo. This presentation, which shows how far ahead of his time Tesla was, impressed on the audience the fact that even today, many inventions are patented, based or referenced on original Tesla patents. Our gala event for the evening was a presentation by the well known Tesla biographer and historian, **Professor Marc Seifer**. His slide presentation revealed little known events and photographs of Nikola Tesla’s life and totally captivated a standing room only audience. Prof. Seifer is the author of the bestselling Tesla biography: “*Wizard, The Life and Times of Nikola Tesla*”. Then, as a special closing event, with the original musical score composed by **Prof. Anthony Holland** of Skidmore College, “The Tesla Tower” playing in the background, we had the *Tesla Coil Demonstration*, showing the wireless concept of electricity transmission. The whole audience was mesmerized by the awesome electrical activity of the Super High Voltage Tesla Coil!



**William Terbo**, Tesla's grandnephew and closest living relative, as well as a Founding Director of the *Tesla Memorial Society*, opened the Sunday sessions with a talk, from a family perspective, into Tesla's personality. Candid and full of anecdotes, it provided a wonderful picture of Tesla. Mr. Terbo and his beautiful wife are very gracious and extremely generous every time we ask for their support. We were honored to have them at our conference.

The remainder of Sunday covered the many medical uses of Tesla coil devices and patents that have led to uses in medicine for fast healing of injuries and to aid poor healing in the elderly. **Ralph Suddath**, a survivor of a near fatal car crash, presented how a Tesla inspired therapy machine, healed his crushed leg, which surgeons wanted to amputate because it had developed gangrene. Mr. Suddath has regained total use of his leg and inspired by his recovery is now committed to making alternative tesla therapy devices, known to the public, including the *Novalite 3000*.



**Ryn Raevis**, is a licensed physical therapist, who introduced Ralph Suddath to the healing device, *Acuscope*. She presented documented cases of tissue regeneration in patients that the conventional medical establishment stated were hopeless. She showed pictures and medical reports on patients she has treated for the past 20 years.

**Jeffrey Behary**, of the *Turn of the Century Electrotherapy Museum*, gave an outstanding presentation on the first electrotherapy devices ever invented, as well as other electrotherapy designs. His museum has the rarest and oldest Tesla electrotherapy devices as well as forgotten Tesla designs.



Then **Dr. Valone** gave his presentation on “Electrotherapy with Tesla Coil Design”. His slide presentation highlighted the Book, *Bioelectromagnetic Healing, a Rationale for its Use*, which is the culmination of 20 years of research in this field. See page 7 for more details.

Our Keynote Speaker for Sunday afternoon was **Dr. Mark Neveu**, President of the National Foundation of Alternative Medicine. His presentation on the uphill battle to bring alternative methods of healing to the medical establishment was eye-opening. Dr Neveu, a former cancer researcher for 9 years at a large pharmaceutical company, resigned from his lucrative position to do this altruistic work. Eager to find new cures that the establishment has failed to produce, he has traveled all over the world, in search of new alternatives in healing and has ongoing clinical studies in four continents, Europe, Africa, America and Asia. Many electrotherapy devices are also being studied by this Foundation, including the PAP-IMI healing device, which uses pulsed electromagnetic fields.



All of us at IRI, feel that this conference succeeded in offering a forum for innovative technologies that are based on Tesla's inventions. We are extremely proud and privileged to have honored the



Centennial of Tesla's Wardencllyffe Tower, his dream of wireless energy transmission and affordable energy for the world. If you would like more information about this fascinating conference, click on the Tesla Technologies & Conference link on the homepage of our website. We offer a *Proceedings of the Tesla Science Conference*, as well as DVDs, Videotapes and cassettes of all speakers presentations, available to order by mail, fax or online. The professional simultaneous recordings of all events were done by **Ted Strain**, of *Lost Arts Media*, who generously offered his time and services to IRI



at no cost. Thanks again Ted! Many Thanks to all our speakers! Heartfelt thanks to the IRI members for helping promote this conference and to all our hardworking volunteers: **Tony Kao, Dwight Beckford, Elaine Chen, David Hamilton and Thomas Mattingly**. Without all of you, this conference would not have been possible! Very Special Thanks to all our attendees who helped make this conference a Great Success!!!



A wide-angle view of the Exhibit Booth area from the IRI Tesla Science Conference of 2003



## ENERGY INVENTIONS ADVOCATED BY INTEGRITY RESEARCH INSTITUTE

- 1) **FocusFusion.org** – Controllable hot fusion project that is compatible with electricity extraction. Makes the Tokamak obsolete. Eric Lerner has already achieved the necessary billion-degree threshold demanded by nuclear physics while funded by a small NASA grant. An environmentally safe, abundant energy source: decaborane. Hydrogen-boron fusion uses a plasma focus device. A recent simulation confidently predicts the LPP reactor can reach break even at 1.5 MA (MA = megamps = million amperes) and produce net energy at 2 MA. Low risk and high payback. Contact: Eric Lerner, 973-736-0522, email: [elerner@igc.org](mailto:elerner@igc.org)
- 2) **Pre-Seismic Earthquake Predictor & Triangulator** – Patented invention (US Patent #4,724,390) by a university physics professor, provides days of advance warning before a major earthquake or volcanic eruption. Published in several journals, texts and conference proceedings, the T-1050 has had several trials and successful predictions of earthquakes. Contact Dr. Elizabeth Rauscher, 480-982-2285 email: [FlyingWG@msn.com](mailto:FlyingWG@msn.com)
- 3) **Magnetic Energy Converter (MEC)** – A robust power-generating device that can produce electricity and a propulsive force. Business plan brings this amazing invention to market within three years. The MEC converts a known energy source that quantum physicists call zero point energy (ZPE), into conventional electromagnetic energy, which can be harnessed as electricity, used to turn wheels, turbines, etc. Inventors Godin and Roshchin (US patent #6,822,361) have published several journal articles, with proof-of-principle prototypes to their credit. Contact Ivan Kruglak, 818-681-0091 email: [ivan@ionsky.com](mailto:ivan@ionsky.com), website: [www.ep-systems.net](http://www.ep-systems.net)
- 4) **Bitterly Flywheel Automobile** – The country's leading manufacturer of nondestructive fiberwound flywheels claims over 95% efficient storage of mechanical energy, exceeding the efficiency of any battery. This project is directed toward creating a Flywheel Powered Hybrid Vehicle by replacing the battery bank with a retrofit flywheel assembly and drive it from LA to Sacramento. Contact Steve Bitterly, 818-710-1428 email: [sbitterly@earthlink.net](mailto:sbitterly@earthlink.net)
- 5) **Dune Solar Still** – Designed by a Portland State Systems Scientist to have efficiency six times that of a conventional greenhouse solar distillation unit. A 180 m<sup>2</sup> solar desalination pilot plant to be produced and tested. A separate portable still project will also be prototyped for backpack applications. US patent pending. Contact Dr. Paul LaViolette, 518-372-2711 email: [StarCode@aol.com](mailto:StarCode@aol.com)
- 6) **Sky-Earth Generator** – Utilizing atmospheric electricity for energy with a proprietary method of inducing and sustaining a micro-vortex electrical gradient of low areal density between the upper highly positive atmosphere and the negative Earth ground. The process is similar to what actually occurs in a tornado but without the wind and high forces. Contact Len Danczyk, 805-966-1234 email: [Len7@cox.net](mailto:Len7@cox.net)
- 7) **Energy Conservation Licensing Program** – Innovative energy efficiency product for any product that plugs into the wall. Designed to be a 200 - 400 kWh/yr electricity savings per computer for example. Contact Ryan Wood, 720-887-8239 email: [rwood@plugloads.com](mailto:rwood@plugloads.com)
- 8) **Ultraconductor Project** – Provides ambient temperature superconductive capabilities in a thin film conductor. Patents and prototypes already generated. Large consumer market. Contact Mark Goldes, 707-280-8210 email: [mrb@ap.net](mailto:mrb@ap.net)
- 9) **Wireless Electric Power Transmission** – Over 10 years of experimental and theoretical work by university professor that confirms all aspects of this revolutionary invention, pioneered by

- Nikola Tesla. Two articles reprinted in Valone's *Harnessing the Wheelwork of Nature* by the inventors describe more details of the safe and highly efficient (95%) electricity transmission method. Contact Dr. James Corum, 304-291-0466 email: [jcorum@ieee.org](mailto:jcorum@ieee.org)
- 10) **Freeze-Framer Biofeedback Device** – Computerized finger sensor that produces lower stress level in minutes. Product developed by the Institute for HeartMath, known for its innovative heart-related science research. Successfully marketed at \$1 M level already. Funding is for expanded marketing plan to ramp up sales to targeted audience. Contact Dr. Deborah Rozman 831-338-8707 email: [drozman@quantumintech.com](mailto:drozman@quantumintech.com)
  - 11) **Synaptic Neuromodulation Treatment Program** – This treatment of Parkinsons disease is just one example of dozens of alternative health therapies available from NFAM. Program includes initiation of clinical trials and inventor assistance for marketing and licensing. Contact Dr. Mark Neveu, 202-463-4900 email: [mneveu@nfam.org](mailto:mneveu@nfam.org)
  - 12) **Computerized AuraMeter** – Unique neurobiological energy signatures for therapists. The only consciousness monitor available today that mirrors chakra activity. Yields a person's immediate response to outside stimuli. Ten years of research by UCLA professor. Prototype completion. Contact Dr. Valerie Hunt 310-457-4694 email: [vhunt@biofields.org](mailto:vhunt@biofields.org)
  - 13) **NovaLite Electrotherapy Machine** – Outperforms other high voltage Tesla coil and Noble gas devices, for healing of a wide range of diseases. Inventor almost lost his leg which needed to be amputated until he discovered electrotherapy. Contact Ralph Suddath, 940-498-0120 email: [Aquajewel@airmail.net](mailto:Aquajewel@airmail.net) website: [www.NovaLiteResearch.com](http://www.NovaLiteResearch.com)
  - 14) **Rife Technology Beam Ray Therapy Device** – Company already has an IRB for research and clinical trials proving efficacy and has applied for FDA approval. Probably the best Rife technology available today. Program includes upgrading several dozen clinics in the US for treatment of chronic pain (once approved by FDA) as well as a wide range of diseases. Contact Lynn Kenny, 205-841-6554 email: [beamray@mailcity.com](mailto:beamray@mailcity.com)
  - 15) **Electrotherapy Teslatron** – Installation in a CA clinic of a successful million volt Tesla coil therapy machine in a room-size treatment protocol for stubborn and terminal disease patients. Several medical doctors routinely work with this inventor and send patients for treatment. 10-patient study ongoing. Contact Guy Obolensky, 845-753-2782 email: [soliton@optonline.net](mailto:soliton@optonline.net)
  - 16) **EM-Probe.com** – Pocket-size magnetic pulser cured inventor of congestive heart condition. Endorsed by doctors and the subject of a NASA four-year study. Contact Glen Gordon MD, 360-297-8736 email: [DrGordon@em-probe.com](mailto:DrGordon@em-probe.com) website: [www.em-probe.com](http://www.em-probe.com)
  - 17) **Transformative Energy-Bioenergy Projects:** (1) *Spiral Magnetic Motor* which uses a magnetic gradient to achieve torque. The motor can be configured into a car motor which will use voltage without current to spark each cycle. The finished prototype will be incorporated into a Bitterly Flywheel vehicle for a followup Phase II project. No fuel is required since the increasing magnetic attraction (gradient) performs useful work. A microturbine powered by magnets is another spinoff project. Magnetic motor optimization design exists from previous engineering study for a linear Hartman magnetic motor and rotational Spiral motor. (2) *Electricity-Generating Shock Absorber* for electric cars that can be prototyped within an 18-month period. (3) Restoration and licensing the *Transdermal TD-100* treatment unit of Dr. Andrija Puharich which was patented to cure nerve deafness, along with the scanning of his personal archives and publication of the "origin of life experiment logs" in IRI possession to put on CD for distribution. (4) *Dental Vapor Ionizer* designed to remove the toxic mercury vapor from dental operatories everywhere in the US where poisonous mercury amalgam is still used. Invention has two model designs and is in production. (5) *Planetary Protector* for incoming meteors, tsunami amelioration, and tornado/hurricane dispersion, uses a Podkletnov projectable gravity impulse device. Journal articles published on collimated beam experimental results. Contact Dr. Thomas Valone, 301-513-5242 email: [iri@erols.com](mailto:iri@erols.com) Integrity Research Institute



# ARTICLES & PAPERS

*including*

**Highlights of**

*Future Energy eNews*

With no net input force, a tiny Brownian motor can transport particles, thus performing work.

# Zero-Point Energy Extraction Feasibility

Thomas Valone, PhD  
Integrity Research Institute, Washington DC  
[www.IntegrityResearchInstitute.org](http://www.IntegrityResearchInstitute.org)

Presented to the Conference on New Energy Alternatives, Extraordinary Technology Conference, and the US Psychotronics Association Conferences, 2003

## Introduction

This zero-point energy (ZPE) study marks a new dimension in research directions for our fuelless energy future, one which this author believes is essential for the survival and travel independence of the human race. A number of significant discoveries were made with the study, by interpreting little-known journal articles with an engineering focus toward energy and propulsion applications. The full 180-page report is available online without charge in Word format, entitled "Feasibility of the Extraction of Zero Point Energy for the Performance of Useful Work."

## Zero-Point Energy Primer

Zero-point energy (ZPE) is a universal natural phenomenon of great significance which has evolved from the historical development of ideas about the vacuum. In the 17th century, it was thought that a totally empty volume of space could be created by simply removing all gases. This was the first generally accepted concept of the vacuum. Late in the 19th century, however, it became apparent that the evacuated region still contained thermal radiation. To the natural philosophers of the day, it seemed that all of the radiation might be eliminated by cooling. Thus evolved the second concept of achieving a real vacuum: cool it down to zero temperature after evacuation. Absolute zero temperature (-273C) was far removed from the technical possibilities of that century, so it seemed as if the problem was solved. In the 20th century, both theory and experiment have shown that there is a non-thermal radiation in the vacuum that persists even if the temperature could be lowered to absolute zero. This classical concept alone explains the name of "zero-point" radiation.

In 1891, the world's greatest electrical futurist, Nikola Tesla, stated, "Throughout space there is energy. Is this energy static or kinetic? If static our hopes are in vain; if kinetic – and we know it is, for certain – then it is a mere question of time when men will succeed in attaching their machinery to the very wheelwork of Nature. Many generations may pass, but in time our machinery will be driven by a power obtainable at any point in the Universe."

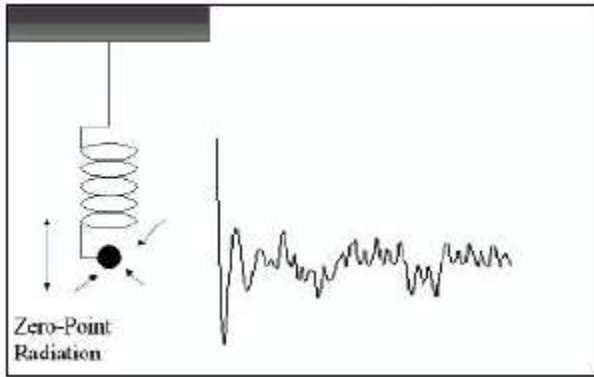
"From the papers studied the author has grown increasingly convinced as to the relevance of the ZPE in modern physics. The subject is presently being tackled with appreciable enthusiasm and it appears that there is little disagreement that the vacuum could ultimately be harnessed as an energy source. Indeed, the ability of science to provide ever more complex and subtle methods of harnessing unseen energies has a formidable reputation. Who would have ever predicted atomic energy a century ago?" A good experiment proving the existence of ZPE is accomplished by cooling helium to within microdegrees of absolute zero temperature. It will still remain a liquid. Only ZPE can account for the source of energy that is preventing helium from freezing.

Besides the classical explanation of zero-point energy referred to above, there are rigorous derivations

from quantum physics that prove its existence. “It is possible to get a fair estimate of the zero point energy using the uncertainty principle alone.” As stated in Equation (1), Planck’s constant  $h$  ( $6.63 \times 10^{-34}$  joule-sec) offers physicists the fundamental size of the quantum. It is also the primary ingredient for the uncertainty principle. One form is found in the minimum uncertainty of position  $x$  and momentum  $p$  expressed as

$$\Delta x \Delta p > h/4\pi \quad (1)$$

In quantum mechanics, Planck’s constant also is present in the description of particle motion. “The harmonic oscillator reveals the effects of zero-point radiation on matter. The oscillator consists of an electron attached to an ideal, frictionless spring.



When the electron is set in motion, it oscillates about its point of equilibrium, emitting electromagnetic radiation at the frequency of oscillation. The radiation dissipates energy, and so in the absence of zero-point radiation and at a temperature of absolute zero the electron eventually comes to rest. Actually, zero-point radiation continually imparts random impulses to the electron, so that it never comes to a complete stop [as seen in Figure]. Zero-point radiation gives the oscillator an average energy equal to the frequency of oscillation multiplied

by one-half of Planck's constant.”

### Executive Summary

Based on the quality of research uncovered and the level of agreement between theory and experiment demonstrated by the thermodynamic mode of ZPE conversion, it is concluded that further attention and funding be primarily dedicated to the exploitation of zero-point energy extraction, beginning with the microscopic realm. While the other three modalities (fluidic, mechanical, electromagnetic) offer interesting and promising developments, the feasibility rating and energy quality rating is the highest with the thermodynamic mode. In particular, it is recommended that:

- 1) **metal-metal nanodiodes** should be researched, with attention to the Johnson noise voltage and purported lack of diode barrier, along with the possible mass production of high density substrates;
- 2) **more ratchet and ratchetlike asymmetries** should be researched, by government, industry and academia, so that a TB lattice or diode assembly may one day offer a truly solid state transducer for ZPE;
- 3) research should continue into **quantum coherence, refractive index change, and stochastic resonance** with a goal of reducing the present relatively large energy investment, so that more robust avenues of product development in ZPE thermodynamics may be achieved.

Brownian motors, thermal fluctuation rectifiers, and quantum Brownian nonthermal rectifiers utilizing AQSR have already achieved a level of theoretical and experimental confidence where further physics research and engineering studies can offer fruitful rewards in the production of rectified DC electricity. This mode of ZPE conversion research and development needs to be continued with earnest in order to expand mankind’s woefully limited portfolio of energy choices.

A broad outline of how to undertake the recommended development work necessarily has specific tasks and milestones associated with

- a) the confirmation of ZPE quantum effects described in this study on a larger scale;
- b) replication of results but also optimization of results; and
- c) engineering tasks of conductor and semiconductor design, nanowires and ohmic contacts.

All of these, along with other tasks not mentioned, need to be included. The project would also include estimates of output current and energy production with any given geometry. Parallel development paths in research and development will always accelerate the completion of the optimum design. A market study should also accompany the work, so a clear focus on the existing niche to be filled is maintained. A national or international project proposal that estimates the required project scope, resources, break-even point and identifies major milestones, has to be formulated, if major progress in ZPE usage is to be achieved. Simply commissioning another study to follow up this study will lead only to institutionalizing the effort without accomplishment of set goals.

This feasibility study of ZPE extraction for useful work has presented a balanced and detailed assessment with scientific integrity, engineering utility and the likelihood of success for further development. It is justifiably concluded that *zero-point energy is deserving of more attention by engineers and entrepreneurs as a serious and practical energy source for the near future*. The proposed project plan for ZPE development, yet to be written, has been reduced to a business endeavor and an exercise in return on investment. A few amazing examples of some recent ZPE discoveries follow below.

### Focusing Vacuum Fluctuations

A method has now been found to concentrate and focus ZPE.

In a Casimir Workshop held in 2002 at Harvard University, L.H. Ford and N.F. Svaiter (Physics Department, Tufts University, Medford, MA 02155) found that the quantization of the electromagnetic field in the presence of a parabolic mirror is possible in the context of a geometric optics approximation. They calculate the mean squared electric field near the focal line of a parabolic cylindrical mirror. This quantity is found to grow as an inverse power of the distance from the focus. Ford and Svaiter give a combination of analytic and numerical results for the mean squared field. In particular, they find that the mean squared ***electric field can be either negative or positive***,

depending upon the choice of parameters. The case of a negative mean squared electric field corresponds to a repulsive Van der Waals force on an atom near the focus, and to a region of negative energy density. Similarly, a positive value corresponds to an attractive force and *a possibility of atom trapping in the vicinity of the focus*.

Empty space contains energy from virtual particles which can move objects.

### Movement from Nothing

Empty space can set objects in motion, a physicist claims.<sup>1</sup> Motion can be conjured out of thin air, according to a physicist in Israel. Alexander Feigel of the Weizmann Institute of Science in Rehovot says that objects can achieve speeds of several centimetres an hour by ***getting a push from the empty space of a vacuum***.<sup>2</sup>

No one has yet measured anything being set in motion by emptiness. But Feigel thinks it should theoretically be possible to make use of the effect to shunt tiny amounts of liquids around on a lab chip, for example. Such small-scale experiments could be useful for chemists interested in testing thousands of different drugs at the same time, or for forensic scientists who need to do analyses on tiny

amounts of material. The whole idea of getting movement from nothing sounds like a gift to advocates of perpetual-motion machines. But there's nothing in Feigel's theory that violates the fundamental laws of physics, so this doesn't provide a way to cheat the Universe and get free energy. Instead, Feigel draws on the well-established notion that empty space does contain a little bit of energy. This 'vacuum energy' is a consequence of the uncertainty principle — one of the cornerstones of quantum mechanics. Because of the uncertainty principle, subatomic particles or photons can appear spontaneously in empty space — provided that they promptly vanish again. This constant production and destruction of 'virtual particles' in a vacuum imbues the vacuum with a small amount of energy.

### Moving in a vacuum

Feigel considered the effects of virtual photons on the momentum — a property defined as mass multiplied by velocity — of objects placed in a vacuum, and came to a surprising conclusion. He started with the fact that electrical and magnetic forces between objects are mediated by photons that flit between them. So an object placed in strong electric and magnetic fields can be considered to be immersed in a sea of these transitory, virtual photons.

Feigel then showed that the momentum of the virtual photons that pop up inside a vacuum can depend upon the direction in which they are traveling. He concludes that if the electric field points up and the magnetic field points north, for example, then east-heading photons will have a different momentum from west-heading photons. So the vacuum acquires a net momentum in one direction — it's as though the empty space is 'moving' in that direction, even though it is empty. It is a general principle of physics that momentum is 'conserved' — if something moves one way, another thing must move the other way, as a gun recoils when it shoots a bullet. So when the vacuum acquires some momentum from these virtual photons, the object placed within it itself starts to move in the opposite direction. Feigel estimates that in an electric field of 100,000 volts per metre and a magnetic field of 17 tesla — both big values, but attainable with current technology — an object as dense as water would move at around 18 cm per hour.

### General Relativity and Vacuum Energy

Jordan Maclay, a NASA-funded quantum researcher, has some interesting observations about ZPE that show its power and complexity.<sup>3</sup> In general relativity, he notes, any form of energy has an equivalent mass, given by  $E = mc^2$ , and is therefore coupled to gravity. This enormous zero-point energy density is equivalent to a mass density of about  $10^{92}$  kg/cc, and would be expected to cause an enormous

The ZPE in a region of space the size of a proton is equivalent to the mass of the universe.

gravitational field. This large field leads to some major problems with general relativity, such as the collapse of the universe into a region of space that is about 1 Planck length across. Thus we have an inconsistency in two very important and well-verified theories, QED and General Relativity. A brief discussion of this problem is given in the excellent book *Lorentzian Wormholes* (Springer-Verlag, 1996, p. 82) by Matt Visser.

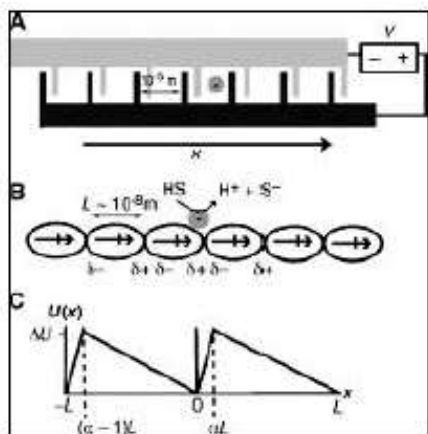
As an instructional exercise, it is possible to compute the equivalent mass for a region of the vacuum about the size of a proton, which is approximately a sphere about  $10^{-13}$  cm across, using the enormous energy density formally predicted above. This process yields an equivalent mass of about  $10^{53}$  kg. This means the vacuum energy contained within a region of space the size of a proton is equivalent to a mass of about  $10^{53}$  kg. A very rough estimate of the number of nucleons in the universe is  $10^{80}$ . This number is based on the statistical distribution of stars in galaxies



and the number of galaxies. Most of the mass of matter is in nucleons, so the mass of the universe is roughly the weight of a proton times  $10^{80}$  or about  $10^{53}$  kg, which is the same as the mass equivalent of the vacuum energy in a region the size of a proton. Conclusion: A volume the size of a proton in empty space contains about the same amount of vacuum energy as all the matter in the entire universe! This sounds like the poet's words, which now ring true, "To see the world in a grain of sand."

### Brownian Motor

R. Dean Astumian has proposed experiments for nonequilibrium fluctuations, whether generated externally or by a chemical reaction far from equilibrium, that can bias the Brownian motion of a particle in an anisotropic medium without thermal gradients, a net force such as gravity, or a macroscopic electric field.<sup>4</sup>



Fluctuation-driven transport is one mechanism by which chemical energy can directly drive the motion of particles and macromolecules and may find application in a wide variety of fields, including particle separation and the design of molecular motors and pumps. Recent work has focused, however, on the possibility of an energy source other than a thermal gradient to power a microscopic motor. If energy is supplied by external fluctuations or a nonequilibrium chemical reaction, Brownian motion can be biased if the medium is anisotropic, even in an isothermal system. Thus, directed motion is possible without gravitational force, macroscopic electric fields, or long-range

spatial gradients of chemicals.

In devices based on biased Brownian motion, net transport occurs by a combination of diffusion and deterministic motion induced by externally applied time-dependent electric fields. Although the electric generator is certainly a macroscopic device, *the electric field in the  $x$  direction averaged over a spatial period is zero no matter what the voltage, and so there is no net macroscopic force.*<sup>5</sup> A nonequilibrium fluctuation can be produced by using a switching device that imposes an externally defined but possibly random modulation of the voltage. Recent experiments have shown that unidirectional motion of microscopic particles can be induced by modulating the amplitude of such an *anisotropic sawtooth potential*. Theory shows that the direction of flow is governed by a combination of the local spatial anisotropy of the applied potential, the diffusion coefficient of the particle, and the specific details of how the external modulation is carried out.

The recent work on fluctuation-driven transport leads to optimism that similar principles can be used to design microscopic pumps and motors – machines that have typically relied on deterministic mechanisms involving springs, cogs, and levers – from stochastic elements modeled on the principles of chemical reactions and noise-assisted processes.

### Energy from a Single Heat Bath

Nothing gets the classical physicist's goat more than asserting that energy can be drawn from a single heat source, in apparent violation of thermodynamics. However, that is precisely what now seems perfectly feasible: a quantum Carnot engine in which the atoms in the heat bath are given a small bit of *quantum coherence*. The induced quantum coherence becomes vanishingly small in the high-temperature

limit at which they operate and the heat bath is essentially thermal. However, the phase , associated with the atomic coherence, provides a new control parameter that can be varied to increase the temperature of the radiation field and to extract work from a single heat bath. The deep physics behind the second law of thermodynamics is not violated; nevertheless, the quantum Carnot engine has certain features that are not possible in a classical engine.<sup>6</sup> This invention is a stellar example of quantum physics paving new ground in the inevitable conversion of ZPE for macroscopic use.

In the presence of unbiased, asymmetric forcing, a noise-directed current always occurs in a dissipative tight-binding (TB) lattice, because of the ratchet-like effect of the asymmetric forcing, like the stochastic ratchets that rectify thermal noise. With stochastic resonance, nonthermal fluctuations are effectively rectified, creating a measurable current. Goychuk believes that the effect should be already observable in superlattices and/or optical lattices.<sup>7</sup> Anomalous transport properties, using SR, which do not exploit the ratchet mechanism have been investigated in driven periodic tight-binding lattices near zero DC bias with the combined effects of DC and AC fields, or DC field and external noise. In particular, Goychuk et al. have found that periodic TB lattices can be driven by unbiased nonthermal noise generated from the vacuum ZPF, generating an electrical current as a result of a “ratchetlike mechanism,” as long as there is quantum dissipation in the system.

For reference, it is worth mentioning that with crystal lattices, thermal fluctuations appear at environmental temperatures, with  $\frac{1}{2} m\omega_0^2 \langle u^2 \rangle = 3(\frac{1}{2} k_B T)$  energy level where  $m$  and  $\omega_0$  are the mass and frequency of the harmonic oscillations and  $u$  is the displacement from a fixed lattice site. The nonthermal oscillations associated with ZPE are  $m\omega_0^2 \langle u^2 \rangle = 3(\frac{1}{2} \hbar\omega_0)$  in terms of energy, adding to the lattice thermal fluctuations.

With the introduction to aperiodic quantum stochastic resonance (AQSR) along with the rectification of nonthermal noise, it makes sense to investigate the amplification of quantum noise. Milonni points out that “the vacuum field may be amplified...if the spontaneously emitted radiation inside the cavity is amplified by the gain medium, then so must the vacuum field entering the cavity. Another way to say this is that ‘quantum noise’ may be amplified.” Since the SR TB lattice current output depends on the noise level, as in the Goychuk simulation, the optimum level of energy extraction depends on parameter control, as in quantum optics, which utilizes quantum noise amplification. This is similar to amplified stimulated emission (ASE) which also uses a gain medium.

## Conclusion

A few pioneers have proposed that a solid state diode or diode array can serve as the template for a ZPE converter. For example Joseph Yater, with his patents and Physical Review articles, was one of these notable visionaries. He theorized that a Schottky diode, formed between a semiconductor and a metal, with nonlinear rectifying characteristics and fast switching speeds, could be the diode of choice for rectifying thermal noise. Yater notes in his U.S. patent #4,004,210 that “for the long range design goals, sub-micron circuit sizes are required if all the high power goals of megawatts per square meter are to be achieved.”

In regards to *rectifying thermal electrical noise*, it is worth mentioning the U.S. Patent #3,890,161 by Charles M. Brown that utilizes an array of nanometer-sized metal-metal diodes, capable of rectifying frequencies up to a terahertz ( $10^{12}$  Hz). Brown notes that thermal agitation electrical noise (Johnson noise) behaves like an external signal and can be sorted or preferentially conducted in one direction by a diode. The Johnson noise in the diode is also generated at the junction itself and therefore, requires no minimum

signal to initiate the conduction in one direction. The thermal noise voltage is normally given by  $V^2 = 4k_B TRB$  where R is the device resistance and B is the bandwidth in Hertz. Brown's diodes also require no external power to operate, in contrast to the Yater diode invention. Brown also indicates that heat is absorbed in the system, so that a cooling effect is noticed, because heat (thermal noise) energy energizes the carriers in the first place and some of it is converted into DC electricity. In contrast, the well-known Peltier effect is the closest electrothermal phenomenon similar to this but requires a significant current flow into a junction of dissimilar metals in order to create a cooling effect (or heating). Brown suggests that a million nickel-copper diodes formed in micropore membranes, with sufficient numbers in series and parallel, can generate 10 microwatts. The large scale yield is estimated to be several watts per  $m^2$ .

Taking these two inventions as a starting point for hardware, the transition to engineering quantum Brownian *nonthermal rectifiers* can be much smoother for the nanophysicist or nanotechnician. For example, as this summary article is being drafted the latest news in this ongoing development is that a molecular photodiode rectifier has been invented, which meets some of the characteristics required for ZPE conversion.<sup>8</sup>

## Resources

The most comprehensive textbook covering the Casimir effect and related vacuum phenomena is *The Quantum Vacuum*, by Peter Milonni, Academic Press(1994). The Casimir effect is covered in *Quantum Mechanics*, Leslie Ballentine, Prentice-Hall (1990). The most recent resource paper with many references on Casimir forces was published by S. Lamoreaux, *American Journal of Physics*, vol. 67, pp. 850-861, October, 1999. A good review describing the breadth of Casimir phenomena is "Casimir Forces" by Peter Milonni and Mei-Li Shis, in *Contemporary Physics*, vol. 33, 313-322 (1992). Another informative review is E.Elizalde and A.Romero, "Essentials of the Casimir Effect and its Computation," *Am. J. Phys.* **59**, 711-719 (1991). A long and detailed review is given by P. Plunian, B. Muller, W. Greiner, "The Casimir Effect," *Physics Reports* (Review Section of *Physics Letters*) **134**, 2&3, pp. 87-193 (1986). Much information is contained in the text *The Casimir Effect and its Applications* by V. Mostepanenko and N. Trunov, published by Oxford University Press, 1997.

## Endnotes

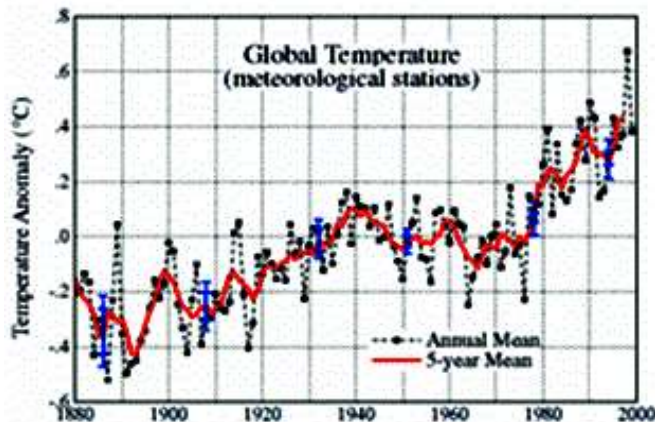
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## As Earth Warms, the Hottest Issue Is Energy

KENNETH CHANG, *New York Times*, November 4, 2003

Suppose that over the next decade or two the forecasts of global warming start to come true. Color has drained from New England's autumns as maple trees die, and the Baltimore oriole can no longer be found south of Buffalo. The Dust Bowl has returned to the Great Plains, and Arctic ice is melting into open water. Upheavals in weather, the environment and life are accelerating around the world. Then what?

If global warming occurs as predicted, there will be no easy way to turn the Earth's thermostat back down. The best that most scientists would hope for would be to slow and then halt the warming, and that would require a top-to-bottom revamping of the



world's energy systems, shifting from fossil fuels like coal, oil and natural gas to alternatives that in large part do not yet exist.

"We have to face the fact this is an enormous challenge," said Dr. Martin I. Hoffert, a professor of physics at New York University. But interviews with scientists, environment advocates and industry

representatives show that there is no consensus in how to meet that challenge. Some look to the traditional renewable energy sources: solar and wind. Others believe use of fossil fuels will continue, but that the carbon dioxide can be captured and then stored underground. The nuclear power industry hopes concern over global warming may help spur a revival.

In an article in the journal *Science* last November, Dr. Hoffert and 17 other experts looked at alternatives to fossil fuels and found all to have "severe deficiencies in their ability to stabilize global climate."

The scientists believe that technological fixes are possible. Dr. Hoffert said the country needed to embark on an **energy research program on the scale of the Manhattan Project** that built the atomic bomb during World War II or the Apollo program that put men on the moon.<sup>1</sup>

"Maybe six or seven of them operating simultaneously," he said. "We should be prepared to invest several hundred billion dollars in the next 10 to 15 years."

But to even have a hope of finding a solution, the effort must begin now, the

<sup>1</sup> After many groups, including the Union for Concerned Scientists, proposed the same large scale program in 2003, the **Apollo Alliance** was formed with Teamsters and union workers being the main labor support as well as environmental groups. Visit [www.apolloalliance.org](http://www.apolloalliance.org) and *New York Times* article of June 6, 2003 <http://www.nytimes.com/2003/06/06/national/06LABO.html?tnemail1> for more information. – Ed. note

scientists said. A new technology usually takes several decades to develop the underlying science, build pilot projects and then begin commercial deployment.

The authors of the *Science* paper expect that a smorgasbord of energy sources will be needed, and they call for intensive research on radical ideas like vast solar arrays orbiting Earth that can collect sunlight and beam the energy down. "Many concepts will fail, and staying the course will require leadership," they wrote. "Stabilizing climate is not easy."

The heart of the problem is carbon dioxide, the main byproduct from the burning of fossil fuels. When the atmosphere is rich in



carbon dioxide, heat is trapped, producing a greenhouse effect. Most scientists believe the billions of tons of carbon dioxide released since the start of the Industrial Revolution are in part to blame for the one-degree rise in global temperatures over the past century. Carbon dioxide concentrations

are now 30 percent higher than preindustrial levels.

With rising living standards in developing nations, emissions of carbon dioxide are increasing, and the pace of warming is expected to speed up, too. Unchecked, carbon dioxide would reach twice preindustrial levels by midcentury and perhaps double again by the end of the century. That could force temperatures up by 3 to 10 degrees Fahrenheit by 2100, according to computer models.

Because carbon dioxide is colorless, odorless and disperses immediately into the air, few realize how much spills out of tailpipes and smokestacks. An automobile, for example, generates perhaps 50 to 100 tons of carbon dioxide in its lifetime.

**The United States produces more carbon dioxide than any other country by far.** Each American, on average, generates about 45,000 pounds of carbon dioxide a year. That is about twice as much as the average person living in Japan or Europe and many times more than someone living in a developing country like Zimbabwe, China or Panama. (Even if the United States achieves President Bush's goal of an 18 percent reduction in the intensity of carbon dioxide emissions by 2012, the output of an average American would still far exceed that of almost anyone else in the world.)

Even if all emissions stop, levels of carbon dioxide in the air will remain high for centuries as the Earth gradually absorbs the excess. Currently, the world's energy use per second is about 12 trillion watts — which would light up 120 billion 100-watt bulbs — and 85 percent of it comes from fossil fuels.



# Welcome to the Future of Automotive Transportation

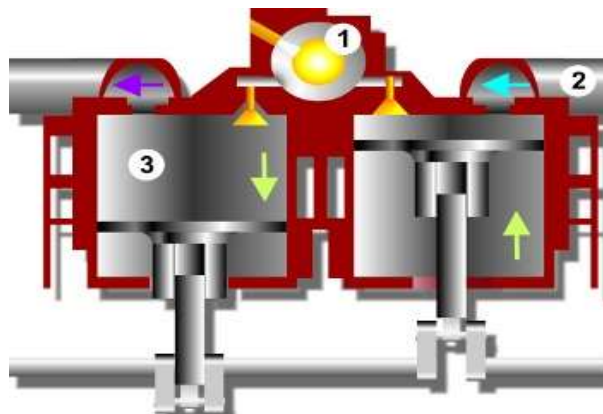
Moteur Development International (MDI), 2003, [www.theaircar.com](http://www.theaircar.com)

It looks as if MDI's compressed-air engine will be one of the major discoveries of the new century. The inventor, Guy Nègre, has developed an engine capable of propelling a car up to 110 Km/h that can cover a distance of 300 km with one tank refill and a cost of less than a cent per kilometer. Not only providing "Zero pollution" but also purifying the air.

Automobiles are one commodity we cannot give up: it forms part of our living standard, but the pollution of our cities affects our quality of life. According to "El Periódico", (9/1/2000): "The pollution produced by traffic causes thousands of deaths in Europe", as well as the problems resulting from the pollution caused by the internal combustion engine. MDI's engine is the ideal system for storing energy in the form of clean, light and safe compressed air.

## How does it work?

The car owes its range to the underfloor storage tanks made of wound carbon fibre with thermoplastic liner, which store 90m<sup>3</sup> of air at a pressure of 300 Bar. The expansion of air in the cylinder pushes the piston. The air that leaves the exhaust pipe is even cleaner than the air that entered, now that prior to the air injection phase the air is filtered. The air conditioning system makes use of the expelled cold air. Due to the absence of combustion the oil change is done rarely, every 50,000 km.



## Basic system

The first piston (1) sucks in and compresses air from the atmosphere. This air is compressed and heated by the piston and when the piston pauses high-pressure air is injected from the storage tank. The expansion of the mixture pushes the piston and turns the engine.

Main characteristics of the mono energy compressed air engine

Cylinder capacity in cm <sup>3</sup> :	566 cm <sup>3</sup> x 4 cylinders.
Max power in ch-CEE (KW-CEE):	25 cv at 3500 Rpm.
Torque max in Kgm-CEE (nm-CEE):	6.3 (61.7)At 800-1300 rpm.
Feeding:	Electronic air injection.
Amount of oil and change freq.:	0.8 Liter for 50.000 Km (Soya oil).

One of the most frequently asked questions regards the safety of the air tanks, which store 90m<sup>3</sup> of air at 300 bars of pressure. Many people ask whether this system is dangerous in case of an accident, and whether there is an explosion risk involved. The answer is NO. Why? Because the tanks are the ones already used to carry liquefied gases on some urban buses, and therefore make use of the technology that is already used to move buses on natural gas. That means that the tanks are prepared and certified to carry an explosive product: methane gas. In the case of an accident, with air tank breakage, there would be no explosion or shattering, now that the tanks are not metallic. Due to the fact that they are made of glass fibre the tanks would crack longitudinally, and the air would escape, causing a strong buzzing sound with no dangerous factor. It is clear that if this technology has been tested and prepared to carry an inflammable and explosive gas, it can also be used to carry air. A final matter with reference to the air tanks, is the improvement that MDI contributed to the original structure. In order to avoid the so-called 'rocket effect', this means to avoid the air escaping through one of the tank's extremities causing a pressure leak that could move the car, MDI made a small but important change in the design. The valve on the buses' tanks are placed on one of the extremities. MDI has placed the valve in the middle of the tank reducing the 'rocket effect' to a minimum. The MDI car also has a small compressor designed to fully refill the tanks in 3 to 4 hours. In France, the first car series are in



production (December 2002) and the first cars will be used to assist float orders. What is its maximum range? The range is dependent on the speed. At 50 km/hr the range is over 300 km. At 100 kmh it is reduced to one third of that. In an urban environment the car can run for up to 10 hours. What is the average estimate price? Between \$8,000 and \$10,000 for the basic vehicle: taxi, van, pick-up truck or "family car". What are the guarantees on the car? The MDI car is guaranteed against all effects of conception or fabrication.

### Official Representative

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[www.theaircar.com](http://www.theaircar.com) (English) [www.motordeaire.com](http://www.motordeaire.com) (Spanish) [www.motormdi.com](http://www.motormdi.com)

(Portuguese) [info@theaircar.com](mailto:info@theaircar.com) <http://www.theaircar.com/contacts.html> More contacts

[http://www.theaircar.com/investors\\_contactform.html](http://www.theaircar.com/investors_contactform.html) Investor form

The Air Car went on display in its first public demonstration in October, 2003 and shortly afterwards, has attracted several US distributors who obtained licenses. – Ed. note

## UC Riverside Researchers' Discovery of Electrostatic Spin Challenges Century-Old Theory

*New physical phenomenon will likely impact atomic physics, chemistry and nanotechnology.*

RIVERSIDE, Calif. -- April 2, 2003 <http://www.newsroom.ucr.edu/cgi-bin/display.cgi?id=548>

In a discovery that is likely to impact fields as diverse as atomic physics, chemistry and nanotechnology, researchers have identified a new physical phenomenon, electrostatic rotation, that, in the absence of friction, leads to spin. Because the electric force is one of the fundamental forces of nature, this leap forward in understanding may help reveal how the smallest building blocks in nature react to form solids, liquids and gases that constitute the material world around us.



Anders Wistrom is with UC Riverside's Dept. of Chem. and Env. Engineering

Scientists Anders Wistrom and Arnik Khachatourian of University of California, Riverside first observed the electrostatic rotation in static experiments that consisted of three metal spheres suspended by thin metal wires, and published their observations in *Applied Physics Letters*. When a DC voltage was applied to the spheres they began to rotate until the stiffness of the suspending wires prevented further rotation. The observed electrostatic rotation was not expected and could not be explained by available theory.

Wistrom and Khachatourian designed the study with concepts they had developed earlier. "Experimental and theoretical work from our laboratory suggested that the cumulative effect of electric charges would be an asymmetric force if the charges sitting on the surface of spheres were asymmetrically distributed," said Wistrom. "In the experiments, we could control the charge distribution by controlling the relative position of the three spheres."

Yet, for more than 200 years, researchers have known only about the push and pull of electric forces between objects with like or unlike charges. Since as early as 1854, when Thomson, later to become Lord Kelvin, theorized about an electric potential surrounding charged objects, scientists have concentrated on understanding how electric and magnetic phenomena are related.

"While Thomson's hypothesis of electric potential has brought enormous benefits when it comes to modern electromagnetic technologies, we now realize that his definition of electric potential was not exact," said Wistrom. "The effects are particularly noticeable when the spheres are very

close to one another." (Electric potential is the ratio of the work done by an external force in moving a charge from one point to another divided by the magnitude of the charge.)

Indeed, the general applicability of Thomson's theory has not been tested experimentally or theoretically until now. In the *Journal of Mathematical Physics*, Wistrom and Khachatourian recently published insights that support the theoretical underpinnings for electrostatic rotation. "It is very satisfying to learn that electrostatic rotation can be predicted by the simple laws of voltage and force that date back at least 200 years," Wistrom said.

He added, "This is curiosity driven research that starts with a simple question and ultimately leads to findings that will likely have impacts across many fields of science and engineering. Because electrostatic rotation without friction leads to spin, we can only speculate how this discovery will provide new approaches to aid the investigation of fundamental properties of matter."

Spin is used in quantum mechanics to explain phenomena at the nuclear, atomic, and molecular domains for which there is no concrete physical picture. "So the discovery of electrostatic rotation and the identification of electrostatic spin as a natural phenomenon opens up an entirely new field of inquiry with the potential for significant advances," Wistrom said.

UC Riverside researchers Anders Wistrom and Armik Khachatourian first observed the **electrostatic rotation** in static experiments that consisted of three metal spheres suspended by thin metal wires. When a DC voltage was applied to the spheres, the spheres began to rotate until the stiffness of the suspending wires prevented further rotation. (Photo credit: Anders Wistrom.)



# Nuclear Fusion Could Power NASA Spacecraft

Duncan Graham-Rowe, 23 January 03 *New Scientist*.

<http://www.newscientist.com/news/news.jsp?id=ns99993294>

The journey time from Earth orbit to Mars could be slashed from six months to less than six weeks if NASA's idea for a nuclear fusion-powered engine takes off. The space-flight engine is being developed by a team led by Bill Emrich, an engineer at NASA's Marshall Space Flight Center in Huntsville, Alabama. He predicts his fusion drive would be able to generate 300 times the thrust of any chemical rocket engine and use only a fraction of its fuel mass.

That means interplanetary missions would no longer need to wait for a "shortest journey" launch window. "You can launch when you want," Emrich says.

The principle is to sustain an on-board fusion reaction and fire some of the energy created out the back of the spacecraft, generating thrust. Of course, harnessing fusion is no easy task. Scientists have struggled to contain the super-hot plasmas of charged ions needed for fusion reactions.

## Bare nuclei

To achieve fusion, scientists heat the hydrogen isotopes deuterium and tritium to at least 100 million kelvin. This strips electrons from the isotopes, creating a plasma of bare nuclei. If this plasma is hot and dense enough, the two types of nuclei fuse, giving off neutrons and huge amounts of energy.

However, the plasma can only be contained by strong magnetic fields, and creating containment fields that do not leak has proved very difficult. What is more, no one has managed to generate a stable fusion reaction that passes the "break-even" point, where the reaction is generating more energy than it takes to sustain it.

Fortunately for Emrich, the reaction would not need to go far beyond the break-even point to generate thrust. And containment is less of a headache because you actually want some of the plasma to escape, he says. "That's where the thrust comes from."

The problem is 100 million kelvin is not hot enough to generate thrust. At that temperature, the fusion reaction only generates neutrons, which are uncharged and therefore cannot be steered and fired through a magnetic jet nozzle. To produce thrust, you need charged particles.

## Bold solution

Emrich is proposing a bold solution. He wants to use microwaves to heat the plasma to 600 million kelvin, triggering a different kind of fusion reaction that generates not neutrons but charged alpha particles - helium nuclei. These can then be fired from a magnetic nozzle to push the craft along.

Emrich has tested the idea with a scaled-down version using an argon plasma. He found that he could get around many of the containment problems by using a long, cylindrical magnetic field with powerful magnets at each end. In a fusion drive, the fields at the end could easily be controlled to release the highly energetic alpha particles and propel the craft.

If fusion researchers can ever achieve stable, break-even fusion, Emrich believes a full-scale fusion drive - perhaps 100 metres long - could be ready and waiting within two decades. He will reveal his plan in full at a space technology forum in Albuquerque, New Mexico, next week.

Fusion Education Website: <http://fusedweb.pppl.gov/>

US Office of Fusion Energy: <http://www.fofe.er.doe.gov/>

**Focus Fusion website:** <http://www.focusfusion.org> (Eric Lerner has succeeded in reaching 1 billion kelvin for this type of propulsion with a NASA grant, far surpassing 600 million kelvin mentioned in this article. We have posted his business plan on the [www.IntegrityResearchInstitute.org](http://www.IntegrityResearchInstitute.org) website for those who are interested. – Ed note.)



## NASA Boosts Nuclear Propulsion Plans

Will Knight and Damian Carrington, January 03, 2003, *New Scientist*, <http://www.newscientist.com/news>

NASA has requested a "very significant" increase in funding for the development of nuclear propulsion systems for spacecraft, according to Sean O'Keefe, the administration's chief. Existing chemical rocket technologies have restricted missions to the same speed for 40 years, he said. "With the new technology, where we go next will only be limited by our imagination." O'Keefe revealed the significant new emphasis in an interview with *Los Angeles Times*: "We're talking about doing something on a very aggressive schedule to not only develop the capabilities for nuclear propulsion and power generation, but to have a mission using the new technology within this decade."

The request has been approved by US President George Bush and will now pass to Congress for approval. NASA's Nuclear Systems Initiative will also be renamed Project Prometheus. Triple speed Researchers believe new nuclear propulsion systems could triple the current speed limit for space travel of 29,000 kilometres per hour. This would make it possible, for example, get to Mars in two months, rather than six. But NASA has dismissed media speculation that it is planning a nuclear-fuelled mission to take astronauts to Mars. O'Keefe's statement emphasized the technology, rather than any specific destinations. "The laws of physics are the only things controlling how fast we go anywhere," he said. "So until we beat the technical limitations ... you basically end up arguing about fantasy missions." NASA's last budget request for its nuclear propulsion and power program was \$800 million over five-years. The value of the new, increased request has not yet been revealed. Continual thrust. The power available from chemical propulsion systems is limited by the quantity of fuel that can be lifted out of Earth's gravity and into space. Spacecraft therefore use short bursts of power and coast towards their destination. Nuclear devices would deliver thrust continually, building up to much faster speeds. The type of nuclear technology NASA plans to develop is not clear.

In May 2002, O'Keefe told Senators: "We have got to find a 'leap ahead' technology." Possibilities include improved ion drives. These use a nuclear reactor to supply electrically charged particles, which are expelled to drive a craft traveling through space. Such engines have already been used on NASA spacecraft like Deep Space One. Fission reactor. NASA researchers have also suggested "nuclear-enhanced air-breathing rockets" to launch spacecraft from Earth. In these, a uranium dioxide fission reactor would heat hydrogen from an on-board tank to 2500°C. The hot hydrogen would then be mixed with air from outside the rocket and combusted at almost 4000 °C. NASA launched one rocket with a nuclear fission unit in 1965. The Soviet Union is believed to have made 33 such launches.

Despite billions of dollars of research in the 1950s and 1960s, nuclear propulsion was abandoned due to technical and political difficulties. Nuclear generators already provide compact and long-lasting power sources for electronics aboard spacecraft too far from the Sun to rely on solar power. These radioisotope thermoelectric generators (RTGs) provide power by converting heat, produced through the natural decay of a radioactive isotope, into electricity. RTGs have been used on 25 different NASA spacecraft including Viking, Galileo, Cassini and Voyager.



## LED Therapy

Joy LePree, Technical Editor, *Product Design & Development Online*,

<http://www.pddnet.com/scripts/showpr.asp?PUBCODE=045&ACCT=0006487&ISSUE=0311http://www.pddnet.com/scripts/showpr.asp?PUBCODE=045&ACCT=0006487&ISSUE=0311&RELTYPE=RWE&PRODLT=C&PRODCODE=0000>

### **High-tech companies are exploring a strange new world to develop devices that cure an assortment of illnesses.**

Almost everyone has seen an episode of Star Trek where the ship's doctor uses a hand-held laser device to heal any and all injuries crew members may have sustained while exploring new worlds. While this seems far-fetched to those of us who are used to receiving more traditional medicines to heal our aches and pains, the truth is light therapy is becoming a reality. Cutting-edge companies are working with partners in the medical research industry, as well as NASA and the Defense Advanced Research Project Agency (DARPA), to provide therapeutic light-emitting diode (LED) devices that may assist in the treatment of anything from wounds to muscle aches to torn ligaments to acne to blindness and more serious illnesses. A nurse practitioner places a **Quantum LED array** on the outside of a patient's cheek where it shines for just over a minute each day, promoting wound healing and preventing mouth sores caused by radiation and chemotherapy.

### **Healing Power Of Light**

Currently a handful of tech companies are making medical LED devices for professional medical use, as well as lower-tech versions for over-the-counter consumer use. While each company's technology differs, they all work on the same basic premise: many illnesses are caused by cells inside the body being starved for energy. Injuries are often slow to heal for the same reason, so if a way can be found to provide the correct wavelength of light (which provides an alternate form of energy) and have it absorbed by those starved cells, it should speed the healing process. "If the cells are starved for energy, you have to find a way to provide them with the energy they need to recover from injury or disease," says Dr. Harry T. Whelan, professor of neurology at the Medical College of Wisconsin in Milwaukee, who is conducting studies using medical LEDs developed by Quantum Devices Inc. "Using LED therapy, the energy that we provide to those cells is in the form of near-infrared light, and the wavelength we've used most often is 670 nanometers, but we are still studying different wavelengths to find the optimum for different clinical situations. And currently, we use about 50 milliwatts per square centimeter of power intensity for a period of about one to three minutes to generate anywhere between four and eight jewels per square centimeter of full energy. The energy is then converted by the cells into a high-energy phosphate, which helps speed the healing." Some LED devices developed by companies other than Quantum operate at significantly lower wavelengths and power intensities. Diomedics makes a bed with more than 2,000 LEDs. It treats the whole body for pain and muscle relaxation.

## Medical Device Makeup

While there's an array of devices out there, from knee wraps to hand-held instruments to entire LED beds, they are all composed of several basic components. First there are the LEDs, which aren't typical LEDs. "The LEDs we use are much more powerful than the ones you have in your computer," says Ron Ignatius, founder and chairman of the board of Quantum Devices in Barneveld, WI. "They are 10 times as bright as the sun, but only offer helpful wavelengths without the harmful ones." Depending on whether the device is a hand-held, a wrap, or a pad, the LEDs are placed on a circuit board or a pad, says Randall Everett, president of Diomedics, a Melrose, FL-based developer of the technology. The devices are either battery- or ac-powered, which is usually preferable. "With batteries, you have constant power for only about an hour and then it starts dropping off and you lose the effectiveness of the treatment," says Everett. When designing medical LEDs, experts say that subtle differences in engineering technology don't result in significant differences in the basic biology of how and why LED therapy works. What's more important than the arrangement of lights or the housing is finding a way to get the appropriate intensity of light and power to penetrate the affected cells. "It's basically different ways of arranging the LEDs to get a certain intensity of a certain wavelength into tissue long enough to activate the energy chemistry of the cells so that the cells have more energy in the form of light and they can channel that energy into running the cells normally," says Whelan.

The key to providing the appropriate wavelength and power is cooling technology, says Ignatius, because it allows the LEDs to supply light without heat. "It is necessary to provide built-in cooling technology to dissipate the heat so you can use the LED therapy, which penetrates very deeply, but still touch the lights to the skin without causing discomfort or burns," he says. The cooling technology used by different manufacturers is usually proprietary and covered by patents. Quantum's Warp 10 is a battery-powered infrared device being used by a handful of special operations forces. Soldiers can carry the device into combat to self-treat muscle aches and wounds.

## Enlightening Product Array

Quantum's devices are considered to be extremely sophisticated because of their higher wavelengths, power intensities, and cooling technology. Because of its expertise in this area, Quantum has been working with NASA and DARPA to develop devices that would be useful in space and on the battlefield. Initially, Quantum began working with NASA to create something that would help stimulate plant growth in space. "I suggested the use of LEDs and they almost laughed me out of the room," recalls Ignatius. "But someone did a little research and found that the idea wasn't all that far-fetched and that it really worked."

Since NASA found that LEDs could be used to provide energy for plant cells to grow, it wasn't that much of a leap to relate the technology to human cells, says Whelan. Subsequently, NASA provided funding to Quantum Devices with the hopes that it could develop a device for astronauts to stem the loss of bone and muscle mass, which occurs during long periods of weightlessness. Studies are being conducted to see if this therapy will work.

Meanwhile, Whelan and engineers at Quantum discovered a more down-to-earth use for this technology in the form of a product called the **Spectralight**. "We are currently using it to treat patients with a condition called mucositis, which occurs as a side effect of cancer treatments," says Ignatius.

Mucositis occurs when the mucous membranes of the body, especially those in the mouth, break down and cause bleeding and ulcers that lead to the inability to eat, making recovery more difficult. "Dr. Whelan found that by exposing just one cheek two minutes a day to the light source it could start eliminating the condition, and later we found that by exposing patients to the light source before the problem even started, it could be prevented," says Ignatius.

Following the success of the Spectralight, Quantum received funding from DARPA to develop a device that soldiers could carry into combat to self-treat muscle aches and wounds with little or no training. In response, Quantum created the **Warp 10**, which is a battery-powered, hand-held infrared device. Currently, a handful of special operations forces are trying the Warp 10 on an experimental basis.

The military is also looking into whether this same device could be used to treat blindness caused by enemy troops using laser weapons. Studies on reversing blindness in rats have shown promise in this area. Although Quantum's products are ultra high-tech devices for use only by professionals or the military, other companies offer over-the-counter LED devices that have been approved by the FDA for treatment of muscle aches and pain.

"The FDA has cleared a number of applications for consumer use, so people can buy them without a prescription," says Richard Braden, president of BioScan, a Palitas, NM-based developer of medical LED therapies. "What used to be just in the realm of the laser surgeon or dermatologist is now available to people because the devices are being powered in such a way that they are completely safe."

BioScan currently has three devices approved by the FDA for consumer use for the treatment of muscle aches and pain. One is a light patch, which is a 5-inch-by-8-inch oval pad with all the LEDs contained within it. The patch is placed on the sore area. Another is a spinal pad designed to contour with the spine. It includes lights placed along the areas that cover the nerve endings that are most responsive to LED energy. The company also has a battery-powered knee wrap, which is a knee brace with light devices built into it so that the user can put it on, turn it on, and walk around while receiving therapy.

Diomedics makes similar products as well as a bed with more than 2,000 LEDs on it. "It looks like a tanning bed and has a box attached that controls the lights," says Everett. "The patient lays on it and it treats the whole body for pain and muscle relaxation at one time."

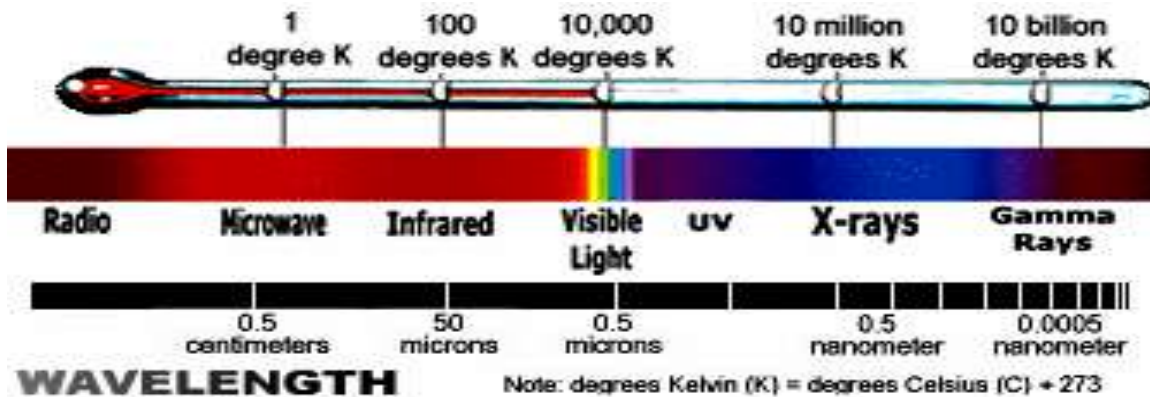
## **Future LED Applications**

Much research is underway on the use of medical LED therapy to determine whether there are other applications for light therapy. "Research is currently being done on the different effects of different spectrums of light on living tissues," says Braden. It is thought that the visible red spectrum, which is roughly in the 600 to 700 nanometer range, is effective with surface issues such as wound care and that higher wavelengths, including infrared, are more penetrating. Studies also suggest that going down to the 400 or 500 nanometer spectrum, which is blue light, might be effective for treating skin disorders including acne and scarring. "Companies in this business are looking at the medical research that is being conducted regarding different frequencies of light to see where this technology might take us," says Braden. He foresees wound care as being the next big application. "You can expect over the next few years to see LED therapy as being the primary treatment for wounds such as post-surgical and non-healing wounds like diabetic ulcers."

Whelan and Ignatius say they would like to test their technology in other clinical situations such as spinal cord injuries and for treatment of Parkinson's disease, strokes, brain tumors, and tissue and organ regeneration.

"It may seem strange to some people because it is very much a change in the whole paradigm of medicine, which has been pretty much poisons and knives up until this point. The use of natural energy at an intensity that is brighter than the sun, but still nonetheless near infrared light at wavelengths that are helpful and not harmful, to enhance the cells' natural biochemistry truly has a lot of potential in the medical arena," says Whelan.

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## COAL: U.S. Promotes While Canada and Europe Move Beyond

Lester R. Brown, *Earth Policy*, December 3, 2003

<http://www.earth-policy.org/Updates/Update30.htm>

On Monday, November 24, the U.S. Congress abandoned all hope for this year of passing an energy bill laden with subsidies for fossil fuels, including coal. While the **White House** strongly supports heavy subsidies to expand coal burning, other industrial countries are turning away from this climate-disruptive fuel, including our northern neighbor, Canada.

In Ontario, Canada's most populous province, the three major political parties agreed early this year on the phase out of that province's five large coal-fired power plants by 2015. This bold plan accelerated with the early October election of Premier Dalton McGuinty, who has pledged to close all the coal-fired power plants by 2007, eight years ahead of the earlier deadline.

The goal is to clean up the air locally and help stabilize climate globally. In terms of cutting carbon emissions, shutting down just the huge Nanticoke power station on the shore of Lake Erie would be equal to taking 4 million cars off Canadian roads.

Ontario is the first Canadian province to turn its back on coal. Its political leaders simply concluded that the health and environmental costs of coal burning are too high. Jack Gibbons, Director of the **Ontario Clear Air Alliance**, calls coal "a nineteenth century fuel that has no place in twenty-first century Ontario." Other East Canadian provinces including Nova Scotia and New Brunswick may soon follow its lead.

Several leading industrial countries are turning away from coal including the United Kingdom and Germany. The United Kingdom, which used coal to launch the Industrial Revolution more than two centuries ago, cut coal use by 40 percent between 1990 and 2001 mainly by substituting natural gas. (Data at [www.earth-policy.org/Updates/Update30\\_data.htm](http://www.earth-policy.org/Updates/Update30_data.htm) ) Germany, Europe's largest industrial economy, cut coal use by a comparable 41 percent from 1990 to 2001. Reduced subsidies, gains in energy productivity, and the massive harnessing of wind energy means the use of coal may be on its way out in Germany as well.

Although some major industrial countries, such as the United States and Japan, are still increasing their coal use, world use has changed little in the last 5 years. And the movement to phase out coal is gaining momentum. *The Economist*, a business-oriented publication, which surprised many readers in July 2002 with a cover story entitled "**Coal: Environmental Enemy Number 1**," is urging adoption of a carbon tax to discourage coal use.



If global temperature continues to rise and the world experiences more crop-withering heat waves of the sort that shrunk the grain harvests of India and the United States last year and of Europe this year, or the life-threatening heat wave that claimed 35,000 European lives in August, the pressure to move away from coal will intensify.

There are two ways of reducing coal use. One is raising energy productivity. The other is shifting to less carbon-intensive sources of energy. Just one quick example on the productivity side. If a world increasingly concerned about climate change were to decide that over the next three years all of the old-fashioned incandescent light bulbs would be replaced with the new compact fluorescent bulbs, which use less than a third as much electricity, hundreds of coal-fired power plants could be closed.

On the renewable side, wind power, now expanding by over 30 percent a year, is on its way to becoming one of the world's leading sources of electricity. Europe is the leader with 24,000 megawatts of generation capacity.

In early October, the **European Wind Energy Association** (EWEA) updated its projections for wind electric generation, raising them by one-fourth to 75,000 megawatts by 2010 and to 180,000 megawatts by 2020. In 2020, EWEA projects that wind-generated electricity will satisfy the residential electricity needs of 194 million Europeans, half the region's population.

As though on cue, two weeks later the United Kingdom approved construction of four massive new offshore wind farms. Western Europe, with enough offshore wind out to a depth of 40 meters (130 feet) to satisfy most of its electricity needs, is fast turning to this new source. While the North Sea is rich in both oil and wind, the oil is being depleted; the wind is not.

Solar cell use worldwide also is expanding by over 30 percent a year. The cost of solar cell generated electricity is falling steadily but lags the fall in the cost of wind power by roughly a decade.

Unfortunately, the United States is falling behind in both wind and solar energy development. Once a leader in wind electric-generation, it has ceded leadership to Europe. And in solar cell production it recently has been eclipsed by Japan. If Congress resuscitates the energy bill next year, it should consider the global environmental consequences of its actions, the job-creating potential of these new energy sources, and the long term costs of lagging in the development of these new energy industries.

Lester R. Brown is President of the Earth Policy Institute and author of *Plan B: Rescuing a Planet Under Stress and a Civilization in Trouble*.

Additional data and information sources at [www.earth-policy.org](http://www.earth-policy.org)

## Report Generates Negative Energy

Richard Morin and Claudia Deane, *The Washington Post*,  
Tuesday, March 18, 2003; Page A27 <http://www.washingtonpost.com/wp-dyn/articles/A42399-2003Mar17.html> (excerpt below)

If you're ever tempted to think that the city's messiest politics are found only on Capitol Hill, have a chat with energy expert Robert L. Hirsch, whose termination from the Rand Corp. last fall still rankles him. His behind-the-scenes tale of a policy report gone awry is awash in policy disagreements and charges and countercharges.

Rand hired Hirsch in January 2001, and he began work on the report "Energy Technologies for 2050," a \$200,000 study commissioned by the Department of Energy's Fossil Energy Program. His mission was to develop a methodology that could be used to evaluate the viability of energy technologies over the next 50 years. Then in October, Hirsch was fired.

On that much, Hirsch and Rand agree. It's what happened in between that's controversial. Hirsch, now head of the National Research Council's Board on Energy and Environmental Systems, said Rand was trying to squash his report because its preliminary conclusions were unpalatable to DOE, Rand's client.

"When management plays around with you for a couple of weeks and then takes [your report] away to give it to somebody else and tells you that the report will go out without the two sections that offended people in DOE -- to me, that's prima facie evidence of a cover-up," Hirsch said. "If that's not the case, I don't know what is." That wasn't the case to Rand. "The problems were with the methodology, not the results," said James Dewar, a senior Rand official and methodology expert who shored up the report. "If the methodology was sound and that's how the results came out, we'd have no problem. Rand certainly doesn't shy away from saying something uncomfortable to its clients."

In the report, Hirsch, an engineer who has worked at DOE and Arco Oil and Gas Co., developed a preliminary methodology and tried it on three technologies: solar cells, fusion and coal gasification. His early conclusions were that coal gasification is close to being practical, fusion research is on the wrong track and solar cells are impractical for large-scale use. He said that rubbed DOE the wrong way, contending the agency is heavily invested in fusion and loath to be seen as being against renewable energy. A DOE spokesman said the agency did advise Rand of its concerns, but that these regarded the work's quality and "a misapplication of the study's parameters."

"Out-of-date data and inappropriate market assumptions led the analyst to reach strongly negative judgments for both photovoltaic and fusion," said a DOE summary of the study and controversy. "While the study reached positive conclusions for the coal-based technology, its serious shortcomings in analyzing the other two technologies led [Fossil Energy] -- and subsequently other DOE offices -- to question the study's overall technical and analytical quality."

Hirsch said he was abruptly fired for sharing a draft of the report, which he admits doing as a last resort, saying he feared the conclusions would not get out otherwise. Rand officials said they cannot comment on the reasons for the firing.

# What Does Energy Really Mean?

Physics Web, July, 2002, <http://physicsweb.org/articles/world/15/7/2>

## Robert P Crease investigates the origin and historical development of the word "energy"

Was there energy before 1800? The question surely makes scientists roll their eyes. Energy, after all, was not discovered or invented. It has powered the Sun for billions of years, made organisms grow for millions and driven industrial machines for hundreds. To claim that energy has not always existed must be the product of science illiteracy or vapid posturing by the "other" side in the science wars.

The history of the word "energy" is well charted and uncontroversial. It comes from the Greek *energeia*, or activity, with the first technical definition of the word being provided by Aristotle. His definition was, however, different from existing things, he said, has an *energeia* related to its end or function, or *telos*. capacity for action its dynamis, and body being "at work" en route to - or Stephen Toulmin has shown, everyday phenomena that he was agent (such as a horse) faces obstacles keeping a body (the cart) in motion.

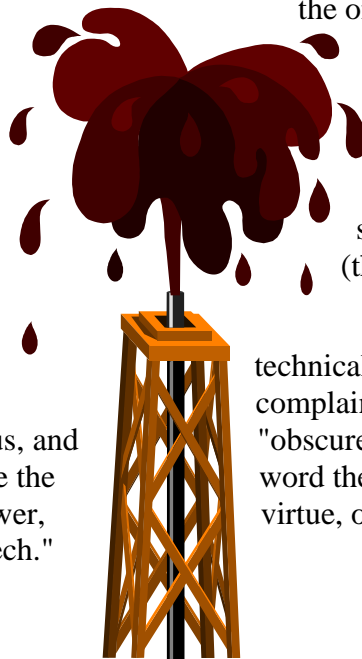
Later, however, "energy" lost its the Scottish philosopher David Hume and "energy" were virtually synonymous, and the *Encyclopaedia Britannica* only gave the term of Greek origin, signifying the power, figuratively, to denote emphasis of speech."

### The Concept

The evolution of the technical concept is experience that individuals have of themselves as a centre of action was one factor. Science historian Stanley Jackson has shown, for instance, that Kepler - like many scientists of his age - believed for a time that nature contained soul-like animistic "agents", treating energy as a secularized version thereof.

"If we substitute for the word 'soul' the word 'force'," Kepler wrote, "then we get just the principle which underlies my physics of the skies." Although he now rejected such souls, he concluded that "this force must be something substantial - 'substantial' not in the literal sense but...in the same manner as we say that light is something substantial, meaning by this an unsubstantial entity emanating from a substantial body."

What was Kepler's "unsubstantial entity"? In the 17th century this question sparked a furious metaphysical and scientific controversy on the existence, nature and measure of force. Descartes spoke of "quantity of motion", which he defined as mass,  $m$ , times velocity,  $v$ , whereas Leibniz argued that the force was not just a quantity but a quality of matter, which he called living force or *vis viva*, given by  $mv^2$ .



the one that we use today. Every that maintains it in being and is He called a body's potential or used *en-ergeia* to refer to the at - that *telos*. As the philosopher Aristotle's views derive from the seeking to explain - in which an (the resistance of road and cart) to

technical meaning. In the mid-18th century complained that the words "power", "force" "obscure and uncertain". As late as 1842 word the briefest of entries: "ENERGY, a virtue, or efficacy of a thing. It is also used

likewise uncontroversial. The subjective

The debate continued through the 18th century and was the subject of Immanuel Kant's first essay. Thomas Young, lecturing to the Royal Institution on collisions in 1807, said that "the term energy may be applied, with great propriety, to the product of the mass or weight of a body, into the square of the number expressing its velocity" - thereby tying the word, apparently for the first time, to its modern concept. But Young's "energy" was not ours. It referred only to what we now call kinetic energy and did not even use our formulation of  $\frac{1}{2}mv^2$ .

Writing on the principle of the conservation of energy, the science historian Thomas Kuhn shows how indebted its formulation was to the phenomena that *its* creators were trying to explain and to its technological and philosophical context. They were interested in how steam and heat engines operate - particularly the question of how to evaluate and measure their efficiency. They had also recently discovered conversion processes between heat, electricity and other phenomena. Finally, Kuhn pointed out, they were influenced by the philosophical view that sought to explain all phenomena in terms of one or two basic forces.

Addressing a dispute between Joule and Carnot over conceptual and experimental problems involving the interconversion of heat and mechanical work in steam engines, William Thomson (Lord Kelvin) mentioned in 1849 that something involving both work and *vis viva* was conserved. He did not, however, think that it was yet visible "in the present state of science". Over the next two decades the full articulation of this insight, involving the recognition that heat was energy - and only one of many forms - would revolutionize science. By the time of the ninth edition of the *Britannica* in 1899, the entry for "energy" was six pages long and littered with technical terms and equations.



### The Critical Point

So was there energy before 1800?

The common-sense answer is "yes". Nature does not change, only our ideas about it. Radical "social constructivists", however, would say "no", arguing that nature is how we represent it and that the real depends on the consensus of the scientific community. Bruno Latour, for example, argues that things - not just words - have histories. He claims that microbes did not exist before Pasteur discovered them and that Pharaoh Rameses II could not have died of tuberculosis (as now thought) because the bacillus was only discovered in 1882.

These two positions represent different ways of interpreting the above events. Permit me to act annoyingly like a philosopher and say that there is truth in each. The formulation of concepts relies not only on purely theoretical considerations but also on a practical world that is rich in technological devices, such as (in the case of energy) steam engines and temperature-measuring instruments. The network of theoretical considerations and the practical world form a context in which scientific claims can be tested as true or false.



If we emphasize the practical values that permeate this context at the expense of the theoretical considerations, we promote a position similar to that of Latour. If, on the other hand, we emphasize the theoretical considerations rather than the practical and technologically rich horizon, we imply that science represents an ahistorical "reality" apart from a worldly context.

This is the history lesson, in a nutshell, that "energy" has to offer.

#### **About the Author**

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A conceptual design for an office building windpower electrical generator



# Future Energy Challenges

Editorial: July, 2002, *Physics World*, <http://www.physicsweb.org>

## Can water, wind and fire save the Earth?

The conservation of energy is one of the fundamental principles in physics. Energy can never be created or destroyed, just changed from one form to another. And every second of every day vast amounts of chemical energy are converted into electrical energy in power stations, and into kinetic energy in cars and trucks, to satisfy the world's demand for power. This is a demand that can only increase if standards of living in the developing world are to improve and poverty is to be eradicated.

The problem is that our ever-increasing energy consumption is having an ever-worsening effect on the environment. Indeed it is proving difficult to get some countries to commit to the modest targets laid down in the wake of the Kyoto agreement.



People with fewer green or global sympathies also have reason to be concerned - last summer's power cuts in California showed that no one can take electricity for granted. And the global uncertainty that has

followed 11 September means that security of energy supply is a higher priority than ever for many nations.

This special issue of *Physics World* contains more than 20 pages on energy, starting with What does energy really mean? by Robert Crease discussing the origins of the word "energy" itself (p15, print version). Valerie Jamieson introduces a special section "Energy challenges for the 21st century" that highlights alternative and renewable energy sources such as solar, wind and wave power (see Energy challenges, p. 25 print version). It is clear that there is no single solution to the multi-faceted energy challenges that we face, and that progress is needed on a wide variety of fronts.

Other articles outline opportunities for the physics community in the energy sector (The role for physics in energy supply, p51 print version only) and describe what it is like to be a physicist working at the sharp end of the oil industry (p55, print version only). It is a coincidence that the lead news story in this issue is about a curious proposal to use "microleptons" - particles that particle physicists do not believe exist - to locate oil deposits (see "Strange events hit rural England," print version).

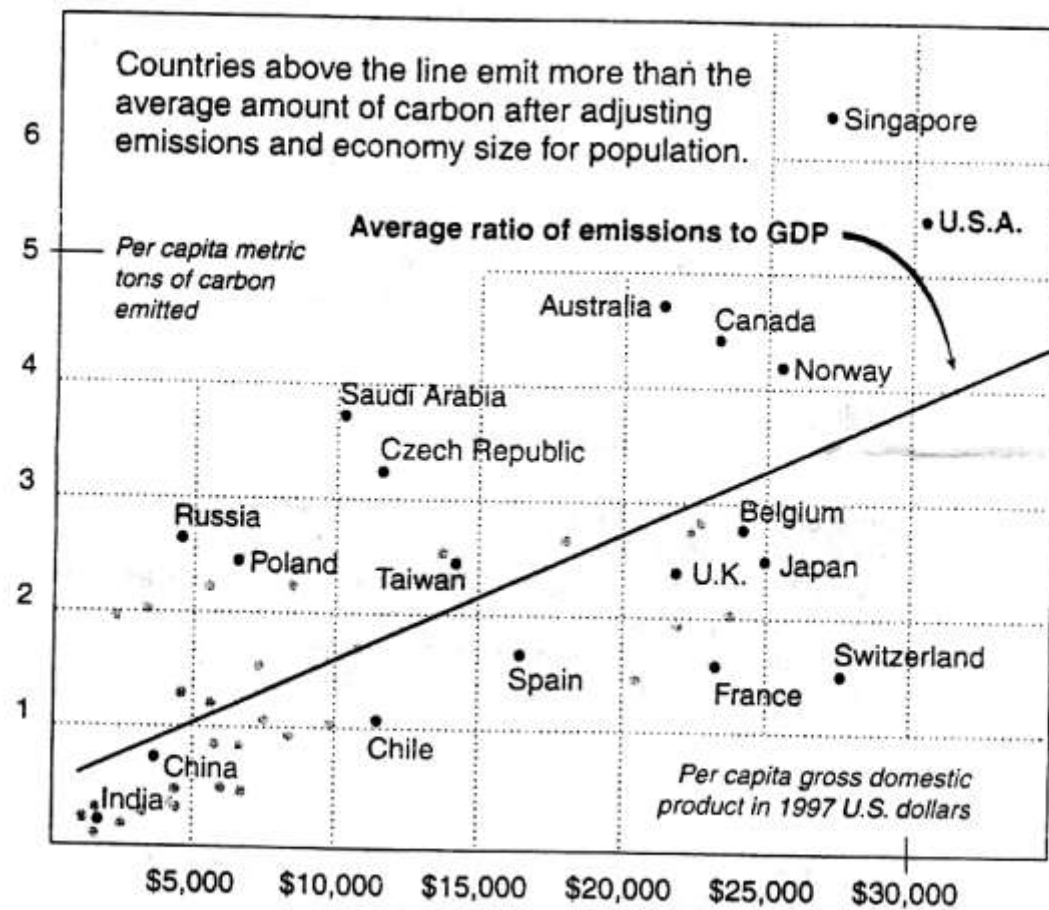
While it is strictly true to say that energy can never be destroyed, the reality is that vast amounts of it are wasted needlessly. Significant amounts of energy could be saved if the efficiency of large power plants were increased slightly and the losses in transmission cables were reduced. And the inefficiency of lighting sources can be doubly wasteful if electricity is not converted into light but heat, which then has to be removed by air conditioning.

If energy is the basic unit of currency in physics, the basic unit of currency in energy is not the Joule or the kilowatt-hour but the dollar. It is hard to believe that it would be financially viable to spend vast

sums to run a cable between two nations with a one-hour time difference between them so that electricity can be sent back and forth depending on which country is experiencing its peak demand. However, power companies across Europe spend millions on just such cables because they offer the cheapest way to get electricity to the customer.

All of the proposed new energy sources have one thing in common - they are more expensive than existing sources. However, there are signs that attitudes to renewable sources are changing as, for example, oil companies expand into solar power. And many in the car industry seem to believe that hydrogen fuel will solve their pollution problems. Remarkably, many transport commentators - in the UK at least - feel that congestion rather than pollution will be the biggest problem in the industry a decade from now.

**Emissions and Gross Domestic Product**



Sources: CIA; Carbon Dioxide Information Analysis Center

James Bronzan/The New York Times

But there is still a need for governments to take a lead to ensure that research that is simply too long term for any one company to undertake still happens, and for regulators to make sure that markets give new energy sources a chance to grow. As the ill-fated experiment with market forces that led to the recent power shortages in California showed, the energy market itself is not smart enough to solve the problem.

# Chronic Fatigue Syndrome and Electromedicine

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**Chronic Fatigue Syndrome (CFS)** is a condition that has become quite prevalent in the last 50 years. It is defined as a debilitating lack of vitality that includes symptoms lasting at least 6 months. These symptoms may include:

- Sore throat
- Muscle pain
- Tender lymph nodes
- Joint pain
- Interrupted sleep
- Unexplained persistent and relapsing fatigue that is not alleviated by rest
- Substantial reduction in previous levels of activity

More women are affected than men are by this syndrome. Even more disturbing, a muscle disorder that also causes weakness, called fibromyalgia, has been found in many CFS patients, according to a study conducted by the Center for Disease Control ([www.cdc.gov](http://www.cdc.gov)). With more than three-quarters of a million people in the United States exhibiting a CFS-like condition, it is becoming a serious health concern.<sup>2</sup>

**The causes for CFS are still undetermined.** Some studies suggest multiple nutrient deficiencies can trigger chronic fatigue. Therefore, proper nutrition, consisting of a well balanced diet is vitally important. Fresh fruits and raw foods are especially recommended. Herbs that are helpful include ginkgo, astragalus, red clover, dandelion and short term use of echinacea to help boost the immune system, which is always affected by CFS. To help improve the interrupted sleep pattern, valerian root or melatonin at bedtime is helpful.

Although numerous studies have been conducted to find the underlying causes of CFS, *none have succeeded in understanding its physiological or*

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<sup>2</sup> Gerrity TR, et al., "Chronic fatigue syndrome: what role does the autonomic nervous system play in the pathophysiology of this complex illness?" *NeuroImmunoModulation*, V. 10, p. 134-141, 2002

*chemical pathways*.<sup>3</sup> Some studies have shown that deficiencies of the adrenal or thyroid glands have been found in CFS patients. This has prompted the belief that stress can trigger CFS, whether it is of mental or physical origin. Therefore energy boosting therapies as well as vitamins and antioxidant supplementation to combat free radical proliferation is often considered to be extremely important.

## How do free radicals deplete cellular energy?

Free radical proliferation is linked to pathological changes that cause cellular malfunction or mutation (i.e. cancer) as well as protein degradation. Free radicals also play a large role in causing damage to all cells of the body but particularly the immune system. Free radicals also *deplete cellular energy* by interfering with mitochondrial function and contribute to shortened lifespan, according to studies with animal species.<sup>4</sup> Cellular energy generation in the mitochondria is both a key source and key target of oxidative stress in the cells. Seeking an electron to complete the radical, free radicals cause chain reactions as electrons are ripped from molecules, creating another free radical. Cellular energy generation in the mitochondria is both a key source and key target of oxidant stress in the cell. One can therefore envision a model whereby the inevitable increased production of free radicals compromises mitochondrial efficiency and eventually energy output in a detrimental feedback loop.<sup>5</sup>

**Antioxidants** such as vitamin A, vitamin E, selenium and coenzyme Q10 supply free electrons and are usually prescribed by naturopathic doctors in order to provide limited relief in counteracting free radical ravages, as long as they are taken regularly. However, electronic antioxidants produced by bioelectromagnetic (BEM) therapy can also satisfy

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<sup>3</sup> Fukuda K, et al., "The chronic fatigue syndrome: a comprehensive approach to its definition and study." *Annals of Internal Medicine*, V. 121, p. 953-959, 1994

<sup>4</sup> Smith P, editor, "Pathways of aging" *Life Extension*, January, 2004, p. 33

<sup>5</sup> Campisi J. "Aging, chromatin, and food restriction—connecting the dots" *Science*, Sept., 2000, V. 289, No. 5487, p. 2062-3

and terminate free radicals, by abundantly supplying the key ingredient usually found only in encapsulated antioxidant supplements...the electron.<sup>6</sup> Indeed, such a pattern of confirmation has been found through our preliminary studies before and after electrotherapy with the *Pharmanex BioPhotonic Scanner* which tests for carotenoid (vitamin A) levels in the blood. The carotenoid levels of the blood are noticeably higher after high voltage electrotherapy, suggesting that free radical levels have dropped since they are not consuming carotenoids at the same rate as before therapy.

**Another indicator of immune system status** and energy storage level of the body is the voltage that is maintained across all of its cell membranes. The so-called transmembrane potential (TMP), typically in the hundred thousand volt range per centimeter, is often found to be much lower during stress and disease states, indicating lower energy levels in the body. In this case, modern medicine does not offer a chemical supplement or pharmaceutical concoction to provide relief. However, the high voltage electric fields presented to the body by bioelectromagnetic therapy can be reasonably expected to boost the TMP directly.<sup>7</sup>

**Damaged or diseased cells** present an abnormally low TMP about 80% lower than healthy cells.<sup>8,9</sup> This signifies a greatly reduced metabolism and, in particular, impairment of the electrogenic sodium-potassium (Na-K) pump activity and therefore, reduced ATP production. The sodium-potassium pump, within the membrane, forces a ratio of 3Na ions out of the cell for every 2K ions pumped in, for proper metabolism. An impaired Na-K pump results in edema (cellular water accumulation) and a tendency toward fermentation, a condition known to be favorable toward cancerous activity.

**Nobel Prize winner**, Dr. Albert Szent-Gyorgi, proposed that cell membranes also rectify alternating currents since structured proteins behave like solid-

state diodes.<sup>10</sup> (A diode passes electricity in only one direction.) It is reasonable therefore to conclude, based on these biophysical principles, that an endogenous high voltage EMF potential of sufficient strength will theoretically *stimulate the TMP, normal cell metabolism, the sodium pump, ATP production and healing*. This far-reaching generalization has already been found in the literature: “*TMP is proportional to the activity of this pump and thus to the rate of healing.*”<sup>11</sup> Furthermore, “increases in the membrane potential have also been found to increase the uptake of amino acids.”<sup>12</sup> Electromedicine therefore, appears to connect to and recharge the storage battery of the TMP, just as sunlight baths connect to and recharge the storage battery of biophotons in cellular DNA.

**Will high voltage electrotherapy become the medicine of the future?** Similar expectations were voiced 100 years ago when pioneers such as Tesla, Rife, and Lakhovsky served medical doctors with their remarkable inventions in electromedicine. Only superior clinical studies along with perseverance and determination to change the pharmaceutical dependency in this country may make the difference this time around. In the meantime, those suffering from chronic fatigue syndrome may find that relatively simple steps can be taken to reduce debilitating free radical attack and boost ATP production through TMP recharging by regular, brief electromedicine treatments.

**Further information** on TMP, ATP and BEM therapy can be found in the book, *Bioelectromagnetic Healing: A Rationale for its Use* by this author. Related websites are [www.novaliteresearch.com](http://www.novaliteresearch.com) , [www.zephyrtechnology.com](http://www.zephyrtechnology.com) , [www.rejuvenetics.us](http://www.rejuvenetics.us) , [www.designmed.com](http://www.designmed.com), [www.lightbeamgenerator.com](http://www.lightbeamgenerator.com) , and [www.IntegrityResearchInstitute.org](http://www.IntegrityResearchInstitute.org) .

<sup>6</sup> Valone TF, *Bioelectromagnetic Healing: A Rationale for Its Use*, Integrity Research Institute, 2003, p. 37

<sup>7</sup> Valone, p. 27

<sup>8</sup> Ceve, G. “Membrane Electrostatics,” *Biochim Biophys Acta*, 103(3):311-82, 1990 **Medline 91027827**

<sup>9</sup> Malzone, A. et al, “Effect on cellular and tissue metabolism of induced electrical currents” *Arch Stomatology* 30(2):371-82 **Medline 90314754**

<sup>10</sup> Szent-Gyorgi, A., *Introduction to Submolecular Biology*, Academic Press, NY, 1960. Also, *Bioelectronics*, Academic Press, NY 1968, and *Electronic Biology*, Marcel Dekker, NY 1976 (See Appendix, p. 46)

<sup>11</sup> Jorgenson, W. A. and B.M. Frome, C. Wallach. “Electrochemical Therapy of Pelvic Pain: Effects of Pulsed Electromagnetic Fields (PEMF) on Tissue Trauma,” *European Journal of Surgery*, 1994, Supplement 574, p. 86

<sup>12</sup> Bockris, J.M. et al. *Modern Aspects of Electrochemistry*, No. 14, Plenum Pub., New York, 1982, p. 512



# How Global Warming May Cause the Next Ice Age...

Thom Hartmann January 30, 2004, *CommonDreams.org*

<http://www.commondreams.org/cgi-bin/print.cgi?file=/views04/0130-11.htm>

While global warming is being officially ignored by the political arm of the Bush administration, and Al Gore's recent conference on the topic during one of the coldest days of recent years provided joke fodder for conservative talk show hosts, the citizens of Europe and the Pentagon are taking a new look at the greatest danger such climate change could produce for the northern hemisphere - a sudden shift into a new ice age. The finding is not at all comforting.

In quick summary, if enough cold, fresh water coming from the melting polar ice caps and the melting glaciers of Greenland flows into the northern Atlantic, it will shut down the Gulf Stream, which keeps Europe and northeastern North America warm. The worst-case scenario would be a full-blown return of the last ice age - in a period as short as 2 to 3 years from its onset - and the mid-case scenario would be a period like the "little ice age" of a few centuries ago that disrupted worldwide weather patterns leading to extremely harsh winters, droughts, worldwide desertification, crop failures, and wars around the world.

If you look at a globe, you'll see that the latitude of much of Europe and Scandinavia is the same as that of Alaska and permafrost-locked parts of northern Canada and central Siberia. Yet Europe has a climate more similar to that of the United States than northern Canada or Siberia. Why?

It turns out that our warmth is the result of ocean currents that bring warm surface water up from the equator into northern regions that would otherwise be so cold that even in summer they'd be covered with ice. The current of greatest concern is often referred to as "The Great Conveyor Belt," which includes what we call the Gulf Stream.

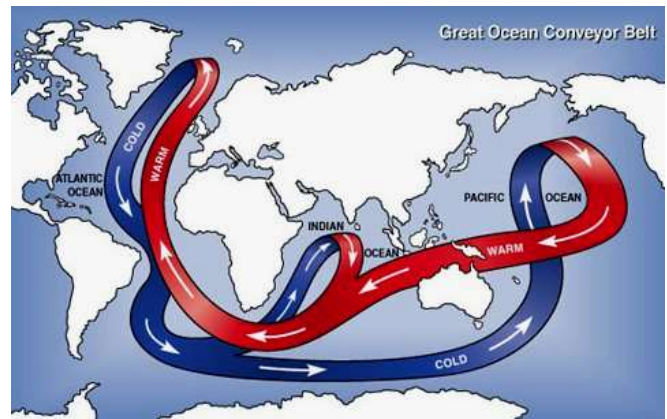
The Great Conveyor Belt, while shaped by the Coriolis effect of the Earth's rotation, is mostly driven by the greater force created by differences in water temperatures and salinity. The North Atlantic Ocean is saltier and colder than the Pacific, the result of it being so much smaller and locked into place by the Northern and Southern American Hemispheres on the west and Europe and Africa on the east. As a result, the warm water of the Great Conveyor Belt evaporates out of the North Atlantic leaving behind saltier waters, and the cold continental winds off the northern parts of North America cool the waters. Salty, cool waters settle to the bottom of the sea, most at a point a few hundred kilometers south of the southern tip of Greenland, producing a whirlpool of falling water that's 5 to 10 miles across. While the whirlpool rarely breaks the surface, during certain times of year it does produce an indentation and current in the ocean that can tilt ships and be seen from space (and may be what we see on the maps of ancient mariners).

This falling column of cold, salt-laden water pours itself to the bottom of the Atlantic, where it forms an undersea river forty times larger than all the rivers on land combined, flowing south down to and around the southern tip of Africa, where it finally reaches the Pacific. Amazingly, the water is so deep and so dense (because of its cold and

salinity) that it often doesn't surface in the Pacific for as much as a thousand years after it first sank in the North Atlantic off the coast of Greenland.

The out-flowing undersea river of cold, salty water makes the level of the Atlantic slightly lower than that of the Pacific, drawing in a strong surface current of warm, fresher water from the Pacific to replace the outflow of the undersea river. This warmer, fresher water slides up through the South Atlantic, loops around North America where it's known as the Gulf Stream, and ends up off the coast of Europe. By the time it arrives near Greenland, it's cooled off and evaporated enough water to become cold and salty and sink to the ocean floor, providing a continuous feed for that deep-sea river flowing to the Pacific.

These two flows - warm, fresher water in from the Pacific, which then grows salty and cools and sinks to form



an exiting deep sea river - are known as the **Great Conveyor Belt**.

Amazingly, the Great Conveyor Belt is only thing between comfortable summers and a permanent ice age for Europe and the eastern coast of North America.

Much of this science was unknown as recently as twenty years ago. Then an international group of scientists went to Greenland and used newly developed drilling and sensing equipment to drill into some of the world's most ancient accessible glaciers. Their instruments were so sensitive that when they analyzed the ice core samples they brought up, they were able to look at individual years of snow. The results were shocking.

Prior to the last decades, it was thought that the periods between glaciations and warmer times in North America, Europe, and North Asia were gradual. We knew from the fossil record that the Great Ice Age period began a few million years ago, and during those years there were times where for hundreds or thousands of years North America, Europe, and Siberia were covered with thick sheets of ice year-round. In between these icy times, there were periods when the glaciers thawed, bare land was exposed, forests grew, and land animals (including early humans) moved into these northern regions.



Most scientists figured the transition time from icy to warm was gradual, lasting dozens to hundreds of years, and nobody was sure exactly what had caused it. (Variations in solar radiation were suspected, as were volcanic activity, along with early theories about the Great Conveyor Belt, which, until recently, was a poorly understood phenomenon.)

Looking at the ice cores, however, scientists were shocked to discover that the transitions from ice age-like weather to contemporary-type weather usually took only two or three years. Something was flipping the weather of the planet back and forth with a rapidity that was startling. It turns out that the ice age versus temperate weather patterns weren't part of a smooth and linear process, like a dimmer slider for an overhead light bulb. They are part of a delicately balanced teeter-totter, which can exist in one state or the other, but transits through the middle stage almost overnight. They more resemble a light switch, which is off as you gradually and slowly lift it, until it hits a mid-point threshold or "breakover point" where suddenly the state is flipped from off to on and the light comes on.

It appears that small (less than 0.1 percent) variations in solar energy happen in roughly 1500-year cycles. This cycle, for example, is what brought us the "Little Ice Age" that started around the year 1400 and dramatically cooled North America and Europe (we're now in the warming phase, recovering from that). When the ice in the Arctic Ocean is frozen solid and locked up, and the glaciers on Greenland are relatively stable, this variation warms and cools the Earth in a very small way, but doesn't affect the operation of the Great Conveyor Belt that brings moderating warm water into the North Atlantic.

In millennia past, however, before the Arctic totally froze and locked up, and before some critical threshold amount of fresh water was locked up in the Greenland and other glaciers, these 1500-year variations in solar energy didn't just slightly warm up or cool down the weather for the landmasses bracketing the North Atlantic. They flipped on and off periods of total glaciation and periods of temperate weather. And these changes came suddenly.

For early humans living in Europe 30,000 years ago - when the cave paintings in France were produced - the weather would be pretty much like it is today for well over a thousand years, giving people a chance to build culture to the point where they could produce art and reach across large territories.

And then a particularly hard winter would hit.

The spring would come late, and summer would never seem to really arrive, with the winter snows appearing as early as September. The next winter would be brutally cold, and the next spring didn't happen at all, with above-freezing temperatures only being reached for a few days during August and the snow never completely melting. After that, the summer never returned: for 1500 years the snow simply accumulated and accumulated, deeper and deeper, as the continent came to be covered with glaciers and humans either fled or died out. (Neanderthals, who dominated Europe until the end of these cycles, appear to have been better adapted to cold weather than Homo sapiens.)

What brought on this sudden "disappearance of summer" period was that the warm-water currents of the Great Conveyor Belt had shut down. Once the Gulf Stream was no longer flowing, it only took a year or three for the last of the residual heat held in the North Atlantic Ocean to dissipate into the air over Europe, and then there was no more warmth to moderate the northern latitudes. When the summer stopped in the north, the rains stopped around the equator: At the same time Europe was plunged into an Ice Age, the Middle East and Africa were ravaged by drought and wind-driven firestorms. .

If the Great Conveyor Belt, which includes the Gulf Stream, were to stop flowing today, the result would be sudden and dramatic. Winter would set in for the eastern half of North America and all of Europe and Siberia, and never go away. Within three years, those regions would become uninhabitable and nearly two billion humans would starve, freeze to death, or have to relocate. Civilization as we know it probably couldn't withstand the impact of such a crushing blow.

And, incredibly, the Great Conveyor Belt has hesitated a few times in the past decade. As William H. Calvin points out in one of the best books available on this topic ("A Brain For All Seasons: human evolution & abrupt climate change"): ".the abrupt cooling in the last warm period shows that a flip can occur in situations much like the present one. What could possibly halt the salt-conveyor belt that brings tropical heat so much farther north and limits the formation of ice sheets? Oceanographers are busy studying present-day failures of annual flushing, which give some perspective on the catastrophic failures of the past. "In the Labrador Sea, flushing failed during the 1970s, was strong again by 1990, and is now declining. In the Greenland Sea over the 1980s salt sinking declined by 80 percent. Obviously, local failures can occur without catastrophe - it's a question of how often and how widespread the failures are - but the present state of decline is not very reassuring."

Most scientists involved in research on this topic agree that the culprit is global warming, melting the icebergs on Greenland and the Arctic icepack and thus flushing cold, fresh water down into the Greenland Sea from the north. When a critical threshold is reached, the climate will suddenly switch to an ice age that could last minimally 700 or so years, and maximally over 100,000 years.

And when might that threshold be reached? Nobody knows - the action of the Great Conveyor Belt in defining ice ages was discovered only in the last decade. Preliminary computer models and scientists willing to speculate suggest the switch could flip as early as next year, or it may be generations from now. It may be wobbling right now, producing the extremes of weather we've seen recently.

What's almost certain is that if nothing is done about global warming, it will happen sooner rather than later. This article was adapted from the new, updated edition of *The Last Hours of Ancient Sunlight* <<http://www.amazon.com/exec/obidos/ASIN/1400051576/commondreams-20/ref=nosim/>> by Thom Hartmann, from Random House/Three Rivers Press. See [thomhartmann.com](http://thomhartmann.com)

# Possible Electric Propulsion Systems for Flying Triangles

Richard Alexander and Adam Whaley, 1997

<http://www.ttauv.freeserve.co.uk/9000electric.html>

The information for this section is taken from several sources including Dr John F. Santarius (University of Wisconsin) Lecture 30: Charge!; Capt. James Szabo's paper "Solar Electric Propulsion Systems"; University of Michigan's College of Engineering Plasmadynamics and Electric Propulsion Laboratory Web Site; Air Force Office of Scientific Research - Electronic Propulsion Web Site; sundry other Internet sources.

Our research into the Flying Triangle "UFO" (which we are becoming convinced is actually a family of such vehicles, and which do not all necessarily use identical propulsion systems or have similar uses) has lead us to believe that the most likely main propulsion system that is employed by craft, similar to that seen in West Wales in November 1996, is of an electrical nature. This is based on the lack of obvious propulsion features seen (or not seen) on the craft as reported by witnesses. Nobody has observed propellers or air intakes and exhausts. Also there is the lack of normal aeroengine noise - although we are aware that the technology does exist to mask such noises. Similarly the extremely bright flashes of light emitted by the craft when in "burst mode" seem to indicate that microwave or laser beam technology is used to propel the craft at these times, whereas the less powerful electric propulsion methods listed below seem the most likely candidates for the "cruise mode" propulsion methods, despite many of them seemingly being designed for use outside of earth atmosphere. We shall deal with the microwave and laser propulsion technologies in another article.

Another problem posed by the previous FT Report was why would a presumed US experimental craft be flown over Wales. Whilst we are not privvy to the secrets of the Pentagon, we would point out that the Captain James Szabo in his Web pages for the USAF Office of Scientific Research states that " The AeroSpace Corporation currently supports a project between the US Dept of Defense and the UK Ministry of Defence for exchanging information on requirements, concepts, R+D, technologies and experiments related to systems such as space-based radar. Electric Propulsion is among the above mentioned technologies."

Electric Propulsion has been designated as a preferred technology for US MilSatCom space vehicles for the 21st Century, based on existing research and experience. Some of these technologies are more hypothetical than others as will become clear. Others, such as the Hall effect thrusters have been operational for nearly 20 years. We shall leave it to our more technologically / scientifically qualified readers to decide which if any of these technologies could possibly be used on the FT craft. We would remind readers that we are looking for something that involves the creation of a plasma around the hull of the craft, whereas it would appear that most of the systems below appear to be more traditional engine designs using the generation of a beam of some sort emitted through a nozzle or similar channel.

The three main types of electric propulsion systems are: ElectroThermal, ElectroStatic and ElectroMagnetic and we will deal with each of these in turn, first in general theoretical terms then looking at specific examples and more detailed technical performance related detail.

## ElectroThermal Thrusters

This class of thrusters does not achieve particularly high exhaust velocities. These are divided into arcjets, resistojets and RF-heated thrusters. The resistojet uses a filament to heat a propellant gas (not plasma), while the arcjet passes propellant through a current arc. The RF-heated thruster uses radio-frequency waves to heat a plasma in a chamber and potentially could reach somewhat higher exhaust velocities.

## Arcjets

No information currently available.

## Hydrazine Arcjet

This electrothermal thruster has an arc discharge which is sustained between an internal cathode and an anode that also serves as an expansion nozzle. a 1.8kW. 500s arcjet and power processor is already available for use on commercial satellites, including the AT&T NSSK ComSat. This form of thruster is considered to be fuel efficient and the radiated emissions from the arcjet and power processor are within accepted limits at frequencies above 500MHz, indicating that conventional GHz

class communications (radar etc) would not be affected by the kW class arcjet system.

### Hydrogen Arcjet

Arcjets for medium power (3 - 10 kW) and high-power (10 - 30 kW) applications have been explored by USAF and NASA. The Phillips Lab ESEX program will fly a 26 kW ammonia arcjet.

### Hydrazine Resistojet

This electrothermal thruster uses a propellant that is fed through a resistive heat exchange prior to expansion through a nozzle. Specific impulse is 300s for 0.5 kW thrusters. Characterised by an absence of plume ionization, meaning that the interaction of a resistojet with spacecraft subsystems is similar to that of a small hydrazine chemical thruster.

### Hydrogen Resistojet

During the 1960's high-powered hydrogen resistojets achieved impressive performances in testing, e.g. 850 sec specific impulse, 85% thrust efficiency at 1 kW to 30 kW input power. Thrust to input power ratio (200 mN/kW) is several times greater than for other electric propulsion systems.

### RF-Heated Thrusters

No information currently available.

### ElectroStatic Thrusters (Ion Thrusters)

The key principle is that a voltage difference between two conductors sets up an electrostatic difference that can accelerate ions to produce thrust. The ions must be neutralised - often by electrons emitted by a hot filament. The three main stages of an ion-thruster are: ion production, acceleration and neutralization.

### Xenon Ion Engine

This thruster uses a Xenon plasma discharge from which an ion beam is extracted using grid-plates perforated with holes. They have been produced by the USA, Europe and Japan. Ion engines use propellant very efficiently. Specific impulse is 3000s at 0.5 kW input power at 55% thrust efficiency. US MilSatCom is currently sponsoring a laboratory investigation of the British UK-10 ion engine. NASA's NSTAR program is intended to test a high power (approx 5 kW) ion thruster for primary propulsion applications. Performance is comparable to the Russian TAL (> 2500 sec specific impulse at > 60% efficiency) and proven. Beam divergence is much less than Hall-Effect thrusters, which alleviates concerns about plume impingement.

### ElectroDynamic Thrusters

There are four main categories of Electrodynamic thrusters: Magnetoplasmadynamic, Hall-effect, Pulsed-plasma and Helicon. Each will be described in turn.

#### Magnetoplasmadynamic Thrusters

In MPD thrusters a current along a conducting bar creates an azimuthal magnetic field that interacts with the current of an arc that runs from the point of the bar to a conducting wall. The resulting Lorentz force has two components: Pumping, a radially inward force that constricts the flow and Blowing, a force along the axis that produces the directed thrust. Note that erosion at the point of contact between the current and the electrodes is generally a problem area for this class of thrusters. A pulsed propulsion system requires many components including a pulse applied-field MPD thruster, a pulse-forming network, a charge control unit, a cathode heater and high-speed valves.

#### MagnetoPlasmaDynamic Thrusters

MPD thrusters use the Lorentz force arising from the interaction of discharge current with self-induced and / or applied magnetic field. Both steady state and plasma MPDs have been developed. Demonstrated performance of steady state MPD thrusters is 20 - 30% at 1000 - 7000s specific impulse and 10 - 60 kW power. Megawatt pulsed MPDs have demonstrated efficiencies above 50% with hydrogen propellant. Pulsed MPDs thrusters can reduce launch mass by between 1000 and 2500 kg over those achievable with hydrogen arcjets. Noble gas propellants could also be used but with lower specific impulses. An MPD thruster does not yet exist at laboratory level which is suitable for orbital transfer applications.

The first major MPD thruster flight test occurred in 1980 on the Japanese MS-T4 spacecraft. The instantaneous thruster performance was 22% efficiency at 2500s specific impulse. Each discharge lasted 1.5ms. During the flight the MPD thruster was successfully operated for over 5 hours and accumulated over 400 discharges.

#### Hall-Effect Thruster

With these thrusters perpendicular electric and magnetic fields lead to an ExB drift. For a suitably chosen magnetic field magnitude and chamber dimensions, the ion gyroradius is so large that ions hit the wall while electrons are contained. The resulting current, interacting with the magnetic field, leads to a JxB Lorentz force, which causes a plasma flow and produces thrust. The most common current Hall-effect thruster is the Russian Stationary Plasma Thruster (SPT).

Xenon Plasma Thruster

This device is analogous to a gridless ion engine with very high thrust density. It is sometimes referred to as a Hall-Effect thruster because of the electron motion in the crossed electric and magnetic fields. Specific impulse is 1600s at 1.4 kW input power with 48% thrust efficiency. Following the 1995 Moscow International Electric Propulsion Conference the US SMC and Aerospace Corporation submitted a proposal to evaluate the Russian SPT-100 for use in US satellites. High power Hall thrusters have been lab tested in Russia, e.g. the 50 kW TsNIIMASH TAL (Thruster with Anode Layer), which has a performance ranging from 3000 - 7000 sec specific impulse and 70 - 75% thrust efficiency.

Pulsed-Plasma Thruster

In a pulsed-plasma accelerator a circuit is completed through an arc whose interaction with the magnetic field of the rest causes a  $J \times B$  force that moves the arc along a conductor.

Teflon Pulsed Plasma Thruster

This is an electromagnetic device in which a high-current discharge ablates the surface of a Teflon bar and accelerates plasma through a discharge channel. PPTs have been used for autonomous orbit correction on NOVA navigation satellites. The use of solid-state Teflon simplifies the propellant feed system and allows for compact packaging.

Helicon Thruster

The principle of the helicon thruster is similar to the pulsed-plasma thruster: a travelling electromagnetic wave interacts with a current sheet to maintain a high  $J \times B$  force on a plasma moving along an axis. This circumvents the pulsed-plasma thruster's problem of the force falling off as the current loop gets larger. The travelling wave can be created in a variety of ways, and a helical coil is often used. No examples available.

**Bibliography**

The following texts are mentioned in the sources as being very useful in fully understanding this area of physics

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Schmidt, G. Physics of High Temperature Plasmas. 2nd edn. (Academic Press, 1979).

Stuhlinger, Ernst. Ion Propulsion for Space Flight (McGraw-Hill, New York, 1964).

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The following Journals and Conferences are important for those wishing to access more recent developments.

AIAA/SAE/ASME/ASEE Joint Propulsion Conference <http://www.aiaa.org/events/jpc02>

Journal of Propulsion and Power.

IEEE Transactions on Plasma Science.

NASA workshops on specific types of thrusters.

The AFOSR - EP WWW Server will eventually contain links to the 8 main research sites, an electronic search engine and a Bulletin Board. Currently there is an impressive list of abstracts of papers published relating to this area of research.

**Editor's Note**

See Oct. 7, 2004 *Future Energy eNews* for a follow-up story on "Black Flying Triangles" Report from NIDS. (All *Future Energy eNews* past editions are posted on [www.IntegrityResearchInstitute.org](http://www.IntegrityResearchInstitute.org))  
-TV



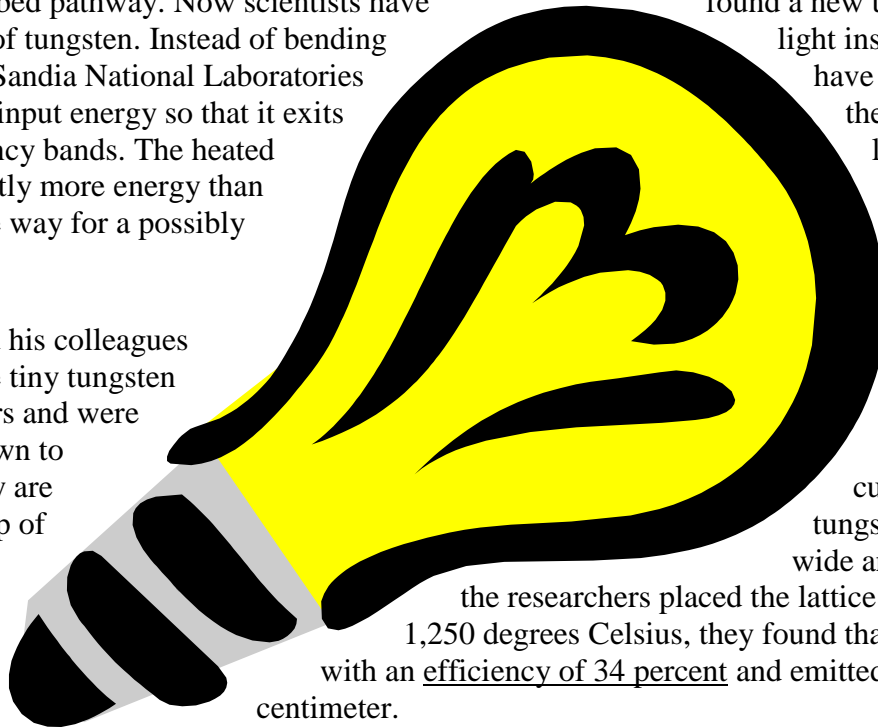
## Tungsten Crystals Provide More Power for Electrical Devices

Sarah Graham -- ScientificAmerican.com -- July 02, 2003

<http://sciam.rsc03.net/servlet/cc?lJpDWABEpkpFLkhsIDJhtE0EC>

Light would seem to be a hard thing to hold on to but that's just what so-called photonic crystals can do. Made of microscopic metal bars arranged into interlocking lattices, photonic crystals trap light of a particular frequency inside. And by introducing impurities at specific sites, scientists can bend the light along a prescribed pathway. Now scientists have found a new use for photonic crystals made of tungsten. Instead of bending light inside a crystal, researchers at Sandia National Laboratories have used a tungsten lattice to filter input energy so that it exits the crystal only in desired frequency bands. The heated lattices are said to emit significantly more energy than solid filaments can, paving the way for a possibly superior energy source.

Shawn Lin and his colleagues have been researching the tiny tungsten lattices for a number of years and were the first to take the crystals down to the first micron dimensions. The lattice they are currently working with is made up of tungsten rods that are half a micron wide and 1.5 microns apart. When heated to 1,250 degrees Celsius, they found that it converted radiation square centimeter with an efficiency of 34 percent and emitted about 14 watts per



the researchers placed the lattice in a vacuum and emitted about 14 watts per centimeter.

**Both of these results are significantly higher than the results predicted by the well-known Planck's law**, which models the maximum emissions expected at specific wavelengths from ideal solid materials. Kazuaki Sakoda of Japan's Nanomaterials Laboratory at the National Institute for Materials Science notes that the "work clearly demonstrates that even Planck's law--the starting point of the era of quantum mechanics [used to predict these interactions]--can be modified."

The dramatically improved output values are seen only at the specific frequencies that the lattice's inner dimensions allow to escape. This property could help to improve the performance of some heat-driven engines. For example, photonic crystals could funnel excess heat from a power plant's generator and release it over a much smaller band of frequencies to drive engines--such as those in electric-powered cars that can absorb energy only within a small range--much more efficiently.

The researchers report their latest findings in two papers that will appear in the journals *Optics Letters* and *Applied Physics Letters*.



# IRI Financial Report

## Revenue and Expenses: Fiscal Year Ending December 31, 2003

<b>Revenue</b>	
Contributions	\$13,598
Program Services	\$0
Investments	\$0
Special Events	\$0
Sales	\$13,207
Other	\$3,380
<b>Total Revenue</b>	<b>\$30,185</b>
<b>Total Expenditures</b>	<b>\$27,785</b>
<b>NET GAIN/LOSS</b>	<b>\$2,219</b>

## Balance Sheet: Fiscal Year Ending December 31, 2003

<b>Assets</b>	<b>Jan 1, 2003</b>	<b>Dec 31, 2003</b>	<b>Change</b>
Cash & Equivalent	\$667	\$4492	\$3825
Land and Buildings	\$0	\$0	\$0
Other	\$4,529	\$4,675	\$146
<b>Total Assets</b>	<b>\$5,196</b>	<b>\$9167</b>	<b>\$3,971</b>

<b>Liabilities</b>	<b>Jan 1, 2003</b>	<b>Dec 31, 2003</b>	<b>Change</b>
<b>Total Liabilities</b>	<b>\$5,377</b>	<b>\$6,948</b>	<b>\$1,571</b>

<b>FUND BALANCE</b>	<b>\$(181)</b>	<b>\$2,219</b>	<b>\$2,038</b>
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