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Annual
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&

IRI Annual Report for 2010

Thomas Valone, Editor



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IRI OFFICERS AND DIRECTORS - 2011

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PRESIDENT'S LETTER

We are pleased to bring to our loyal IRI Members another carefully crafted Future Energy Annual for 2011 which for the first time, includes the highlights of the same year instead of the year for which the Financial Report is designated. In other words, the **Highlights 2011** immediately follow this letter, since most people wanted more recent information, as we tried to do last year by combining two year's worth of highlights together. Our IRS report is usually filed in the summer since we are nonprofit so that is why the Financial Report is always for the year before.

This is a transition year for me since I plan to retire from my government position as a Patent Examiner in Spring 2013 and devote full time to IRI charitable work. One of the top projects which I call the Solid-State Electrogravitics Transducer will be a follow-up to the meeting that I had in 2010 with a retired black project S-4 engineer. I learned a lot and took pages of notes. The Transducer was already published in the book (p. 274-5) *Secrets of Antigravity Propulsion: Tesla, UFOs and Classified Aerospace Technology* which is available from IRI or Amazon, by my colleague, Dr. Paul LaViolette but no one, including myself, paid much attention to it. It might be included in the upcoming movie, "Sirius" but I'd like you to be the first to know that I was able to independently verify its details of the magnesium, zinc, and bismuth layers and the same dimensions that Paul wrote about from a sample that was analyzed. The exciting part of this discovery and corroboration is that with the right RF excitation, the transducer produces a unidirectional force, properly called a electrokinetic force from Dr. Jefimenko's electrokinetic equation which I published in last year's Future Energy Annual 2010 (p. 21). We hope to have a sample made and tested and will keep you informed of our progress.

The past year 2011 was important for a number of reasons. The chief among them in my mind is the number of **zero-point energy developments** that occurred in just one year. This issue contains the major breakthroughs including the patent issued to Haisch-Model for a "Casimir engine" that has been successfully tested this year (FE Annual 2010, p. 9), light from the vacuum by a moving mirror (p. 26), spherical Casimir pistons (p. 20), and the verification of some aspects of the Godin-Roschin homopolar machine (p. 36, 39).

We look forward to further good news as three major filmmakers have contacted IRI for interviews on future energy and zero-point energy in the past year. There is a growing groundswell of interest in our work. My contribution to the first and last chapters of the edited volume, *Physics of the Zero Point Field and its Applications to Advanced Technology* by NovaPublishers.com is a sign that the public wants more technical information on this vital science of the future.

Sincerely,



Thomas Valone, PhD, PE
President

INTEGRITY RESEARCH INSTITUTE HIGHLIGHTS 2011

Conferences & Presentations: Our Institute had a busy year in 2011. Chief among many conferences was 1). *“The Third “SPESIF” Space and Propulsion Energy Technologies*



Applications Forum March 15-17, 2011. This year IRI co-sponsored the event with IASSPES at the University of Maryland, Samuel Riggs Center which included our yearly Conference on Future Energy (COFE) familiar to our members. There were over 70 presentations with speakers from Academia as well as Government and Corporate Facilities that deal with energy innovation in

Space,
Domestic
technologies

and Health areas. All presentations were recorded by Lost Art Media and DVDS are available for sale on our website and catalog. Proceedings of this conference is available online free at the Elsevier Science Physics Procedia thanks to our collaborative effort with IASSPES by splitting the cost upfront. We benefited attendance of 200+ and proceedings are available online all over the world benefiting thousands. 2) Special Presentation at the 18th Natural Philosophy Alliance Conference on July 6-9, 2011 at the U of MD College Park Facility. Dr. Valone’s presentation was entitled: “Quantum Vacuum Zero Point and Negative Energy: Theory and Applications”. We also had an exhibit booth with materials for public education. Benefited attendance of 300.



Future Energy News Program:

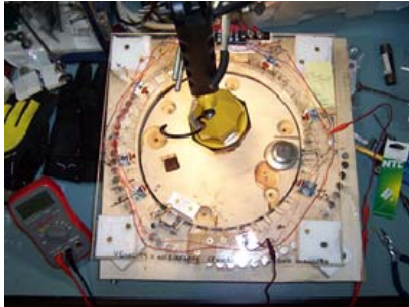
FUTURE ENERGY eNEWS



Research of new emerging technologies; public appearances, free newsletters, brochures, and reports that include the latest news on energy developments, discoveries and research given to the public. *“Future Energy eNews”* is sent via email, monthly, to over 8000 recipients worldwide, free of charge through Constant Contact email service. Also we published the Quarterly *“Future Energy Quarterly Magazine”*, and mailed it to all members for free. This magazine contains all the latest papers and articles relating to emerging energy technologies. Also more upgrades were done to our IRI website

including more information on emerging energy technologies, climate change, video uploads and press releases. With the popularity of Facebook and Twitter, we are happy to report that IRI now has a Facebook page and a Twitter account and is reaching more people than ever through it!

Spiral Magnetic Motor Program. This program is researching the capability of a totally



permanent magnet motor design for mechanical torque production of the new V-track. Mike Gamble of Boeing has been collaborating with us on this project through suggestions, articles, etc. This research will continue for the next 4 years. We are also very interested in the related work of Dr. R.W. Carroll of the University of Illinois at Urbana and plan to contact him to work together once funding comes through. Proposals for further funding have been sent to several groups that

have shown an interest in developing a new way of producing clean energy for transportation and electricity generation.

Zero Point Energy Program.

The research continues on the possibility of tapping zero point energy through zero biased diodes. In our lab, we are currently researching this ability and many journal papers are being prepared for submission to several physics journals including one for the Institute of Physics Journal which will propose the use of zero biased diodes arrays as thermal electric noise rectifiers and non-thermal energy harvesters. We are currently seeking more funding for this program through investors. We are collaborating with Dr. Thorsten Ludwig of Germany's

DEAC Power Cell with THz Limit

Assume a 10 cm³ (10 cc) box for convenience and 1 pW/diode

← 10 cm →

Nano-sized diodes = 10¹¹ per cm²
 assuming 2 mm per layer with 1 mm substrate, yields 5000 diode layers =
500 trillion diodes × 1 pW = 500 W

This conservative estimate, **assuming only a 1% efficiency** for total energy conversion, still reaches the **kW/m³ range of production, 24/7 from ambient thermal and non-thermal energy combined.** This calculation also ignores the 1/f and the f range of noise that exceeds 10 nV and 10 fA per root hertz.

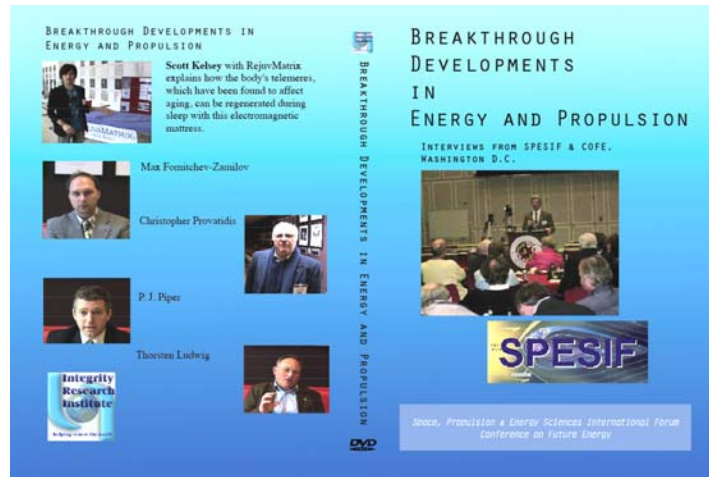
GASE on a journal paper that discusses the effects of ZPE on magnetism. Much research is still being done for this paper and completion is slated for 2013.



Bioenergetics Program. This program is designed to research bioelectromagnetics, and electrotherapy. Includes research on equipment, therapy machines and providers of electrotherapy. We continue to closely work in partnership with Dr Shealy and his graduate assistant, Scott Kelsey on our ongoing research of telomere (DNA) lengthening through Pulsed EMFs. The preserving of the invaluable, Puharich Laboratory Notes by Dr. Andrija Puharich will continue through 2012. Our line of **PREMIER**

electrotherapy devices continue to be improved and we have a Canadian Lab doing a clinical study of them. Results should be forthcoming in 2012. The Microcurrent Electrotherapy clothes project is moving forward and a non-provisional application number was received in June 2011 from the US Patent and Trademark Office. We also are working and researching with Tesla coil pioneer Mark Bean his Carcinotron High Voltage System. We have designed and produced several Tesla coils, Lakhovsky antennas to research the effects this HV device has on the body and are documenting their effects.

IRI Publications: 1) “The new *SPESIF CD Proceedings* was jointly edited with IASSPES and completed, now being sold through our website as well as IASSPES. Also we published all the papers from SPESIF 2011 through the Journal Elsevier Science, Physics Procedia both on printed form and online access. The cost for making these proceedings available for free to the public was split between IRI and IASSPES. 2)



The “Breakthrough Developments in Energy and Propulsion” DVD. This new DVD was produced with Free Spirit Productions and has amazing interviews with 5 prominent breakthrough inventors including: Thorsten Ludwig, P.J Piper, and Scott Kelsey. Its available on our website and catalog. 3) “**Future Energy Annual 2011**” was also published and mailed free to our membership. Includes our latest papers on Energy, including: Zero Point Energy, Electrogravitics, Energy generation, Bioelectromagnetics, as well as the IRI Annual Report for 2010 and financials 3) We



are also happy to report that we now hold the copyright of new amazing book “**Understanding Tesla Coils and Beyond**” authored by Mark Bean, who generously donated the unpublished manuscript to IRI. We are in the process of editing the book which is a detailed guide to building and understanding Tesla coils. Publication of this new book has been slated for 2012. 4) Dr. Valone also contributed a chapter to a new anthology called “Prometheus” which deals with energy. The chapter Dr Valone contributed was on Zero Point Energy.

Solar Bottle Bulb Lights Up Lives

Water + Bottle + Sun= Light

Bibi Farber, NextworldTV Press Release, Dec. 21, 2011,
<http://www.nextworldtv.com/page/5048.html>

Ed. Note: Sometimes the most useful free energy innovation can be the most low tech

utilization. However, IRI recommends www.solatube.com for roofs that are thicker than just a piece of corrugated metal. Bring the sun indoors today and fight seasonal affective disorder (SAD) as well! - TV

A "light bulb" now exists that does not use any conventional energy.

Introducing the Solar Bottle Bulb -- an alternative source of daylight powered by the sun. It is made from an old soda bottle. By filling it with water and sealing it into the roof, the water refracts the sun's rays and provides about 55 watts of light to a darkened room.

This video introduces you to the village of Sitio Matigaya in the Philippines where hundreds of these bottles have been installed. The villagers are saving money on electric bills, and literally seeing a big difference in their lives.



Video of Solar Bottle

This was invented in 2006 by students at the Massachusetts Institute of Technology (MIT). It can be built and installed in less than 1 hour, and uses inexpensive or recycled materials. The water is mixed with some bleach to kill algae and does not need replacing for about 2 years.

The organization Myshelter Foundation through Isang Litrong Liwanag plans to light up a million homes in the Philippines by 2012! They call it "A Liter of Light". More power to them!

Also visit www.isanglitrongliwanag.org to donate or volunteer.

ANOTHER STORY ON SOLAR

CHINESE SOLAR MACHINE

Kevin Bulls, MIT Technology Review, January, February 2012

<http://www.technologyreview.com/article/39356/?nlid=nlenrg&nld=2011-12-19>

Ten years ago, solar panels were made mostly in the United States, Germany, and Japan. Chinese manufacturers made almost none. But by 2006, the Chinese company Suntech Power had the capacity to make over a million silicon-based solar panels a year and was already the world's third-largest producer. Today Chinese manufacturers make about 50 million solar panels a year-over half the world's supply in 2010-and include four of the world's top five solar-panel manufacturers. What makes this



particularly impressive is that the industry elsewhere has been doubling in size every two years, and Chinese manufacturers have done even better, doubling their production roughly every year. This dominance isn't due to cheap labor in Chinese factories: making solar cells requires such expensive equipment and materials that labor contributes just a small fraction of the overall cost. Nor is it because the Chinese companies have introduced cells that last longer or produce more power: by and large, they make the same type of silicon-based solar panels as many of their competitors around the world, using the same equipment. They have succeeded in large part because it's faster and cheaper for them to build factories, thanks to inexpensive, efficient construction crews and China's streamlined permitting process. The new factories have the latest, most efficient equipment, which helps cut costs. So do the efficiencies that come with size. As a result, Chinese manufacturers have been able to undercut other makers of silicon solar panels and dash the hopes of many upstarts hoping to introduce novel technology.

But the solar market is rapidly evolving, and technological innovations are becoming increasingly essential. Though demand for solar power continues to grow around the world, the market is flooded with photovoltaic panels: worldwide production capacity more than doubled from 2009 to 2010 and continued to increase in 2011. The overcapacity was so great that last fall, Chinese manufacturers had trouble selling solar panels for more than it cost to make them. In such a market, the way to differentiate your product-and charge enough to stay afloat-is to make it better than your competitors'.

For solar manufacturers today, that means inventing cells that are more efficient at converting light to electricity. As the price of solar panels has fallen, installation costs have come to account for a greater percentage of solar power's cost. Customers want panels that are more powerful, so that they can install fewer of them. From now on, the best way for Chinese manufacturers to lower the cost per watt of solar power may not be by lowering manufacturing costs but, instead, by increasing the number of watts each panel generates. "The game is now changing," says Mark Pinto, executive vice president of energy and environment solutions at Applied Materials in Santa Clara, California, the world's largest supplier of solar manufacturing equipment. "Before, it was all about scale. Now it is about conversion efficiency while keeping the cost down."

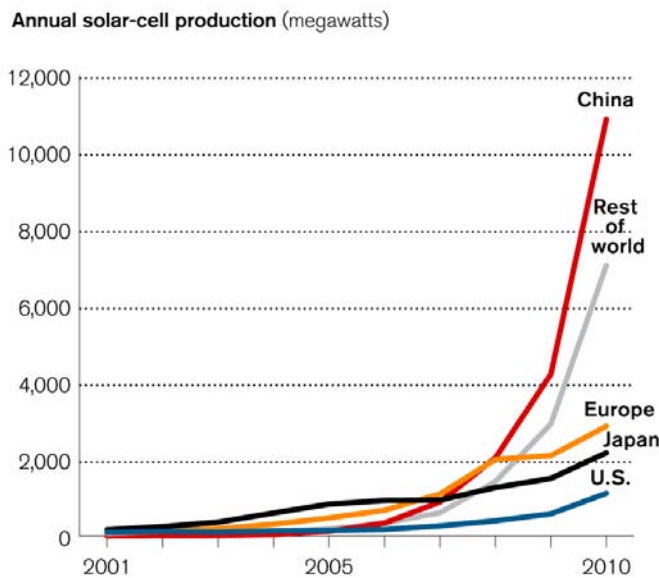
This might sound like bad news for Chinese manufacturers that have focused on scaling up standard technology. But their experience in building conventional solar panels could help them implement new designs that significantly boost the performance of silicon solar cells. Over the years, these manufacturers have lowered costs in part by developing better ways to manufacture the cells. That's given them an understanding of what works and what doesn't on the factory floor. They also have the capital and the engineers to help them translate newer technologies into mass production. They might not have initially set out to commercialize those technologies, but now, having mastered the market for conventional solar panels, they're poised to do just that.

KEEPING PACE

In 2010, when the U.S. secretary of energy, Steven Chu, gave a speech to the National Press Club laying out his case that the United States was falling behind in advanced manufacturing, Suntech Power was his Exhibit A. He had toured its factory, and he was impressed by what he'd seen. "It's a high-tech, automated factory," he said. "It's not succeeding because of cheap labor." Not only that, he noted, but Suntech had developed a type of solar cell with world-record efficiencies.

FAR AHEAD

China's production of solar cells is far outpacing everyone else's.



Source: GTM Research

Chu's assessment might have surprised some observers, but Suntech's record-setting solar cells

are impressive. The technology that goes into them takes advantage of changes in both design and manufacturing technique. The conductive metal lines that collect electric charge from the silicon aren't created with screen-printing methods, as is standard. Instead, Suntech uses a proprietary process to deposit much thinner, more closely spaced lines that are more efficient at extracting electricity from the cells. The changes have allowed the company to reach efficiency levels and cost reductions that an industry road map released in 2011 had set as targets for 2020.

"When you put all those things together, we are not only doing better than what people are doing now," says Stuart Wenham, the chief technology officer at Suntech. "We are also doing better than

what they think they could be doing in 10 years."

So far, Suntech has made relatively few solar panels based on the new technology. Instead, it has focused its resources on tweaking manufacturing processes to decrease the cost of making conventional silicon solar panels. But that could soon change. This year Suntech has started to increase production of the new cells, and now it can make enough of them annually to generate 500 megawatts of power—roughly 2.5 million solar panels. That achievement owes much to the company's success as a producer of the conventional products.

The technology behind the new cells was developed in the 1990s at the University of New South Wales, Australia, but the techniques used in the lab were too expensive for commercial production. It was a "horribly sophisticated process" including photolithography, vacuum deposition of "quite exotic metals," and "all sorts of chemical processes," says Wenham, who is also head of the photovoltaics research program at UNSW and was formerly a professor of Suntech's CEO and founder, Zhengrong Shi. According to Wenham, the technology remained a lab curiosity for decades until Suntech's researchers figured out how to adapt it to an assembly line. "They came up with a simple, low-cost way to replace all of that while achieving the same results," he says. The new technology could increase the power output of a standard-sized solar panel from 205 watts to 220 watts or more—and the cells cost less to produce than conventional ones.

Individual parts of the technology were quickly successful. Suntech introduced these into its standard manufacturing lines, with an eye to keeping just ahead of its competitors in terms of cost and efficiency. Scaling up the complete process, however, was a challenge. A pilot manufacturing line was up and running in 2009, but the company had to develop and implement new equipment to get yields and production rates to the point that the process was economical. Here Suntech's position as a market leader with experience in developing new manufacturing equipment proved critical. Not only did the company have the expertise it needed to improve the process; it also had the funds to keep working on the technology for years without its bringing in significant revenue. Suntech isn't the only Chinese solar manufacturer to identify promising new technology and find ways to produce it at a large scale. Last September, Yingli Green Energy, based in Baoding,

announced that a partnership with a Dutch research center, ECN, had yielded solar panels that could convert 17.6 percent of the energy in sunlight into electricity; the average is just over 14 percent. "ECN made the technology available to anyone in the world who wanted it," Wenham says. "Yet it's only been Yingli that's taken that technology and worked out how to make it in large-scale production, at low cost."

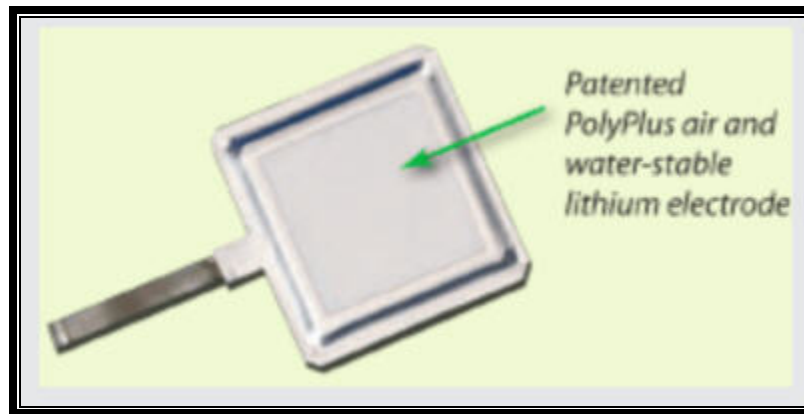
PolyPlus Lithium/Water Battery - "Game Changer"

EV World NewsWire, March 3, 2011, <http://evworld.com/news.cfm?newsid=25321>

Ed. Note: This PolyPlus invention was also voted one of the "Best 50 Inventions" of the year in Time magazine. - TV

Batteries made of lithium and seawater (or just plain tap water for that matter) could be on their way to a marine [market](#) near you. That's courtesy of a technology made by a 11-year-old company called PolyPlus and various partnerships, which hails out of Lawrence [Berkeley](#) Labs and has a grant from the Department of Energy's high risk, early-stage ARPA-E [program](#). At the annual ARPA-E Summit this week, PolyPlus was highlighted as a potential game-changer by ARPA-E Director Arun Majumdar, and I got a chance to sit down with PolyPlus CTO Steven Visco on Monday.

The chemistry almost sounds like that of science fiction, but Visco told me in an interview that he thinks the company's water battery could get to market in two years time, and says the company is just starting the process of producing a water battery pilot production line now. The water battery isn't even the end goal for PolyPlus; the company is developing a non-rechargeable lithium-air and a rechargeable lithium-air battery, which is the most difficult of the three to manufacture and for which it received the ARPA-E grant.



Here's how the water battery works: An encapsulant encloses the lithium, completely separating it from the water, but still enabling a charge. That's crucial because lithium and water react rather shockingly (Visco showed me videos of lithium essentially dissolving in water).

Visco says it was a Eureka moment when he realized the battery worked, using a membrane from a third party in [Japan](#) and the company's own three-layer system, and was stable in 2003. "Cycling lithium and water was absolutely unheard of," and after that, the company went "dead silent," says Visco, and turned to filing patent after patent.

A water battery can achieve awe-inspiring energy densities (the amount of energy that can be

stored in a battery of a given size) of 1,300 wh/kg (for small batches), and potentially 1,500 wh/kg at larger scale production. For comparison, standard lithium-ion batteries have closer to 200 wh/kg to 400 wh/kg. That means a water battery can last a very long time. Picture a battery used for a device on the outside of a ship, or an underwater unmanned vessel that needs power (hello, DOD), that can just keep going and going

The water battery also doesn't have to carry the positive electrode, or the water, inside it. PolyPlus' water battery has an open system where the water of the surroundings connects with the lithium. That means the battery could be more simple and lower cost to produce.

All in all, Visco thinks the marine battery market could be half a billion dollars. That could be overambitious, as many of the applications we discussed are early-stage themselves. But a battery expert source I talked to about PolyPlus' water battery thought the device was well on its way and could be a big hit for the company.

The rechargeable lithium-air battery, for which it received the ARPA-E grant, could be considerable harder. Though the dream is even bigger: a battery that one day could make electric vehicles with ranges from 300 to 500 miles. If PolyPlus gets there, it will be at least five years away, and perhaps two decades before car makers start using these types of batteries for EVs. It took an innovative car company like Tesla that long to put standardized lithium-ion batteries into EVs.

Still, you have to wonder why PolyPlus hasn't moved into manufacturing before this. Visco told me the company doesn't want to be just a licensing company, but wants to be manufacturer and is in the process of raising funds from VCs and strategic investors right now. When the funding round are closed, hopefully, the water battery will be on its way.

RELATED ARTICLE

New Battery Technology Could Provide Large-Scale Energy Storage for the Grid

Dexter Johnson / Fri, November 25, 2011 IEEE Spectrum

<http://spectrum.ieee.org/nanoclast/semiconductors/nanotechnology/new-battery-technology-could-provide-largescale-energy-storage-for-the-grid>

I, like many others, have been [following the work being done by Yi Cui](#) at Stanford University in improving battery technology.

Cui's work has often aimed at improving Li-ion battery technology, much in the same way [researchers at Northwestern University recently have done](#) in getting a silicon-graphene sandwich to act as a more effective anode.

But in his [most recent research](#) he has abandoned the use of lithium ions and replaced them with either sodium or potassium ions for his new battery technology.

The result is a battery that Cui and his colleagues claim is able to retain 83% of its charge after 40,000 cycles, which compares more than favorably to Li-ion batteries of 1,000 cycles.

The researchers have been able to develop a cathode material that they can essentially mix in a flask by combining iron with cyanide and then replacing half of the iron with copper then making crystalline nanoparticles from the compound.

There is a weight penalty with this battery technology, which means that it will not be likely powering any laptops or electric vehicles. However, it may be the perfect fit for large-scale energy storage on the electrical grid.

"At a rate of several cycles per day, this electrode would have a good 30 years of useful life on the electrical grid," said Colin Wessells, a graduate student in materials science and engineering who

is the lead author of a paper describing the research, published this week in [Nature Communications](#).

"That is a breakthrough in performance - a battery that will keep running for tens of thousands of cycles and never fail," said Cui, who in this case is Wessell's adviser and a coauthor of the paper. But all is not resolved as of yet. While the researchers have developed this 'new chemistry' for the battery, they only have the high-power cathode at this point, so they still need to develop an anode.

Nonetheless the researchers are confident they will develop a material for the anode. If they manage to get that sorted, they may have developed an economical battery for storing energy from solar and wind power so as to avoid sharp drop offs in electricity in the grid.

Artificial Photosynthesis to Produce Hydrogen-Based Fuels

Dave Levitan, IEEE Spectrum and EV World, November 2011, <http://evworld.com/news.cfm?newsid=25321>

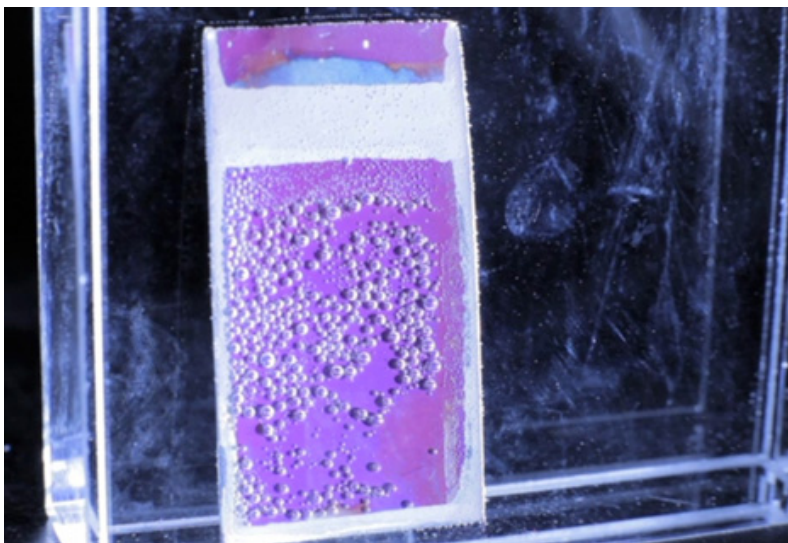


Photo: Sun Catalytix

If every leaf on the planet can do it, maybe we can too. Scientists have long tried to mimic photosynthesis as a way to harness the [energy](#) in sunlight and turn it into a usable fuel, just as plants do. There have been big technical challenges for just as long, and though scientists are far from the ultimate goal, two reports published online in the journal [Science](#) yesterday describe some solutions to the obstacles.

In [one report](#), a group led by MIT chemistry professor [Daniel Nocera](#) found a new way to use light to [split](#)

water molecules into oxygen and [hydrogen](#), which could then be stored and used as a fuel. [Other groups have had some success with this process before](#), but there were always stumbling blocks that would make it hard to scale up or commercialize, such as extremely acidic or basic conditions, expensive catalytic materials, or both. However, Nocera's group managed to get artificial photosynthesis to work using benign conditions and cheap, abundant materials as catalysts.

Specifically, the team joined a commercially available triple-junction [solar cell](#) to two catalysts: cobalt-borate for splitting the water molecule and a nickel-molybdenum-zinc alloy to form the hydrogen gas. The water-splitting reaction achieved a sunlight-to-fuel conversion of 4.7 percent in one incarnation of the device and 2.5 percent in another. The difference between the two was that the more - efficient device housed the hydrogen-generating alloy on a mesh wired to the solar cell. The less efficient version was wireless, and the alloy was instead deposited onto the stainless-steel back of the solar cell.

It is the wireless possibility, where the entire device is self-contained, that researchers say is most exciting. "Because there are no wires, we are not limited by the size that the light-absorbing material has to be," says Steven Reece, a research scientist with [Sun Catalytix](#) (a company

cofounded by Nocera) who worked on the discovery. "We can operate on the micro- or even nanoscale...so you can imagine micro- or nanoparticles, similar to the cells we've worked with here, dispersed in a solution." The researchers say they are still deciding what size the final product should be-anywhere from a small, leaf-sized stand-alone system that might be able to power an individual home to a much larger system that could benefit from economies of scale. Whatever size they decide on, the researchers believe such devices could help provide power in poor areas that lack consistent sources of electricity.

"As the inputs are light and water, and the output is fuel, one can certainly see the applicability of something like that to the developing world," says Thomas Jarvi, chief technology officer at Sun Catalytix. Jarvi says the company expects to be able to bring the device to the point where a kilogram of hydrogen could be produced for about US \$3. Given that a gallon of gasoline contains about the same amount of energy as 1 kg of hydrogen, as long as gas prices stay north of \$3 per gallon, this would make a cost-effective fuel source.

[Daniel Gamelin](#), a professor of chemistry at the University of Washington who works on related topics but was not involved with the new study, says the MIT and Sun Catalytix work represents an "impressive accomplishment." However, he says, it remains to be seen whether silicon is really the most desirable material to use, noting that something less susceptible to degrading by oxygen may be a better option.

"For these specific devices, there remain open questions about their long-term stability," Gamelin says. "And their efficiencies would still need to be increased substantially to be commercially viable. But there is obviously potential for improvement on both fronts. In the bigger scheme, [this research] marks important progress toward the development of truly practical solar hydrogen technologies."

[The other report](#), published simultaneously with the hydrogen producer, demonstrated a different type of advance-a step toward [using sunlight to recycle carbon dioxide](#). In the natural world, the sun's energy extracts electrons from a water molecule, which then reduce CO₂ into fuel (in plants, the fuel takes the form of carbohydrates). University of Illinois graduate student Brian Rosen and other scientists were able to invent a device that electroreduced CO₂ to carbon monoxide at a lower voltage than previously achieved. The high voltages usually required have been a primary stumbling block in CO₂ electroreduction in the past. Rosen's group brought the voltage down by using a combination of a silver cathode and an ionic liquid electrolyte that presumably stabilized the CO₂ anion. And according to Rich Masel, who led the research and is CEO of [Dioxide Materials](#), a company working on CO₂ electroreduction with the University of Illinois, this piece of the photosynthetic process could eventually lead to a way to turn captured CO₂ into "syngas"-a mixture used in the petrochemical industry to make gasoline and other fuels.

The experiment "shows that one can make syngas efficiently from any source of electricity," Masel says. However, large-scale versions of the device probably won't be demonstrated until 2018. "Presently we have demonstrated the process on the 1-centimeter-squared scale. We need to go to the million cm² to make significant amounts of gasoline."

Work on artificial photosynthesis has ramped up considerably in recent years. In July 2010, the DOE began funding a [Joint Center for Artificial Photosynthesis](#) to the tune of \$122 million over five years as part of its Energy Innovation Hubs program; it is led by Caltech professor of chemistry Nate Lewis. The center, with close to 200 members in universities and national laboratories across California, aims to build on nature's photosynthetic design, bridging all the disciplines required, from chemical engineering to applied physics.

In an interview earlier this year, Lewis told *Spectrum* that progress is certainly being made, but it isn't clear yet if the right combination of catalysts and light absorbers and everything else that goes into practical artificial photosynthetic devices has been found.

"We're seeing light in the tunnel," he said. "We don't know where the end of the tunnel is. It's a curved tunnel."

[Dave Levitan](#) is a science journalist who contributes regularly to *IEEE Spectrum's* [Energywise](#) blog. He recently wrote about how [biology is inspiring more efficient wind power](#).

Several Scientists Achieving Success with LENR

Integrity Research Institute Press Release October 2011

Ed.Note: *Many scientists have been diligently working on Low Energy Nuclear Reactions for years and lately their efforts seem to be paying off. Andrea Rossi from ECat is getting quite a bit of media attention, but there are many others. Among them, Dr George Miley, Professor Emeritus at University of Illinois. Dr. Miley is internationally known for his pioneering research in condensed matter nuclear science, for which he received the Preparata Medal 2006-2007 and the 1996 Edward Teller Medal for ICF research. He is a Guggenheim Fellow and a Senior NATO Fellow. He received the 2006 "Integrity in Science" Award from our Institute.*



Dr Miley receiving the 'Integrity In Research' Award from Dr Valone at COFE2 in 2006

We contacted, Dr Miley, fresh from presenting his latest paper at the [World Green Energy Conference](#) to give us an update on the work being performed by his team which includes a Postdoc and 5 students.

Dr. Miley states: " Yes, we are getting some good gas loading results at the 100s of watt level! Basically we fill a pressure tube with about 20 g of nanoparticles and then open a valve to quickly pressurize with D₂ (or H₂) up to 4 ATM. The particles start heating due to the exothermic heat of adsorption. Then at some point the LENR reactions are triggered adding additional heating. The system will eventually come to an equilibrium condition with the heat source being the LENR reactions. If the gas pressure is released, the

temperature would normally drop due to the endothermic effect of desorption of the gas, but the LENR heat effect actually continues for a time due to the gas flux and remaining loading in the nanoparticles. This causes a temperature rise followed by a slow drop off. However, we still have much to do to confirm and fully understand these results. Plus we need to work on the nanoparticle production to be sure we have reproducible particles - and operation. We have been considering (along with others) commercializing small 100 W units rapidly in order to get this into the open and change public attitudes. (others at the WGES meeting were pushing for much larger commercial units for specific applications). However, we have not yet had time to give much thought to the engineering design a practical unit. Our current lab unit has excellent vacuum pumps, heating-cooling controls, etc. which would not be on a "market" type sealed unit. Also, we need to consider liability issues (the combination of hydrogen and nanoparticles = a potential but manageable risk) plus some low level radioactivity". Another very important target is to develop a 3 kW energy to replace the Pu²³⁹ heat source in Radioisotopic Thermoelectric Generators used by NASA in almost all space probes to date. LENR unit scale very nicely heat wise vs. Pu²³⁹, but has minimum radioactivity and a very long operational time with adequate gas supply. NASA scientists at NASA Glenn Labs who work on RTGs have expressed great interest in this possibility.

Recharging the Battery: Hidden Power

by James Mitchell Crow Aug. 25, 2011, New Scientist issue 2827.

<http://www.newscientist.com/article/mg21128272.300-recharging-the-battery.html?full=true>

IF THERE is one thing that symbolises the incredible success - and dismal failure - of 21st-century technology, it is the battery. Each year we spend some \$50 billion on the things, mostly to go in our cameras, cellphones and laptops. They give us abilities our parents could only dream of. Yet batteries are also a titanic headache, both for engineers who must squeeze these objects into tight spaces, and for the millions of us who curse them whenever our gadgets run out of juice.

Help could finally be at hand, though, now that researchers are starting to rethink electrical storage from the bottom up. They foresee a time when the very fabric of modern life - ordinary materials such as plastics and concrete - will hold much of the electricity we need. Utilising familiar stuff in this way not only promises to keep the power flowing wherever we go, but it could signal the end of the battery as we know it. In future, that plastic casing on your smartphone won't just protect the circuits inside; it will keep them supplied with juice too. The walls and floors of your home could also do double duty - as infrastructure that also keeps the lights burning. Even humble paper could play a vital role in keeping you switched on.

According to [Emile Greenhalgh](#), one of the first places you'll notice a difference will be on your driveway. Though your next car is likely to look familiar, its sleek bodywork could well be made from lightweight composites rather than steel. And if Greenhalgh, a materials scientist at Imperial College London, has his way, this bodywork will help store the energy that your vehicle's electric motor needs for the daily commute. "We think the car of the future could be drawing power from its roof, its bonnet or its door," he says.

His vision emerged in 2003, when he was approached by researchers from the UK government's research agency, the [Defence Science and Technology Laboratory](#). They were after a new material for uncrewed aerial vehicles that would be strong enough to bear a load but could also store electrical energy. Greenhalgh and his colleagues were intrigued and set out to design one.

They began with a material that is already revolutionising the aerospace industry: carbon fibre. The stuff is renowned for high strength and low weight. When used to reinforce plastic resins, it forms a tough composite used in Formula One racing cars and new passenger jets like [Boeing's 787 Dreamliner](#). Though carbon-fibre composites are not known for electricity storage, the fibres are good electrical conductors - useful when you want them to store charge. "Some commercially available carbon fibres perform really well as electrodes," says Leif Asp of the [Swerea Sicomp research institute](#) in Gothenburg, Sweden. "That was not what we expected."

Rather than building a battery, Greenhalgh decided to focus efforts on developing another energy-storage device: a capacitor, or in this case a souped-up "supercapacitor". A battery has two electrodes separated by an electrolyte. The difference in electric charge between the electrodes causes charged ions to flow through the electrolyte when the battery is part of a circuit, causing current to flow. Batteries therefore store electricity in chemical form, while in capacitors all the charge accumulates on the electrodes, and an insulating layer keeps these charges apart. The solidity of a capacitor is what makes them easier to adapt for load bearing.

The key to creating a capacitor that can store electricity in amounts useful to your gadgets is to maximise the electrodes' surface area. So Greenhalgh coated each carbon fibre with a bristling layer of conducting carbon-nanotubes. He then weaved this furry spaghetti into two flat electrodes, added an insulating fibreglass layer between them, and encased the lot in a polymer resin.

The nanotubes brought an unexpected benefit - they not only stored a lot of charge, but they made the supercapacitor panel extremely strong. In part, this is down to their surface area, which helps to create a better bond between the fibres and the resin. The nanotubes also act like guy ropes, extending out from the slender carbon fibres and helping to stop them from buckling under a load. The result is a tough,

lightweight panel that can store 1 watt-hour per kilogram, around 1/20th of the capacity of a conventional supercapacitor (see chart).

Greenhalgh now heads a European-wide project called Storage, which, in partnership with Volvo, aims to construct a hybrid-electric car in which a large steel panel in the vehicle's floor will be replaced by a [composite supercapacitor](#). By shrinking the main battery and eliminating heavy steel, the panel should shave some 15 per cent from the vehicle's weight. However, though Greenhalgh is confident he can improve on his supercapacitor's existing storage capacity, he admits that you will probably never drive an electric vehicle powered solely by such capacitors as they are unlikely to ever match the capacity of lithium-ion batteries.

Lightweight laptops

Still, such panels offer significant advantages, particularly for hybrid cars with regenerative braking, which slows a car by converting the kinetic energy of movement into electrical energy. Supercapacitors are perfectly suited for collecting these short bursts of energy and putting it back into the system when they accelerate. That means the main battery can be smaller and lighter, and should last longer in service.

That said, other members of the Storage consortium are still keen to entirely eliminate conventional hybrid-vehicle batteries. Asp, in particular, wants to turn lithium-ion batteries themselves into structural composites. Again, carbon fibre is a surprisingly good place to start as one of the electrodes in a conventional lithium-ion battery is usually made from graphite, and carbon fibres are essentially graphite threads. Batteries are tricky to adapt to a dual role, though, because their electrolyte is often a gel or liquid. So Asp's team is formulating a mix that incorporates a tough polycarbonate as well as a liquid electrolyte. Asp claims its capacity will eventually match that of existing lithium-ion batteries.

Asp's "composite battery" could eventually offer lightweight versions of conventional laptops and cellphones, or new designs that run for longer without needing a recharge. However, that might not happen overnight, as carbon-fibre composites aren't cheap. When they are eventually commercialised, structural batteries are likely to appear only in the most expensive products at first. That might not include cars, though. "What Volvo has found with electric cars is that steel is too heavy. They have to go to composite cars anyway," says Greenhalgh. "Our material gives a bonus."

Structural batteries need not always be expensive, though; they can also be based on seriously low-tech materials - stuff so cheap that you wouldn't think twice about parking your car right on top of it. In 2007, two researchers at the University of Cambridge laid the foundations for a future in which concrete walls, floors and even driveways could double up as huge batteries. Gordon Burstein and Erek Speckert reckoned that, because concrete contains millions of tiny water-filled pores, it should behave like an ionic conductor. When sandwiched between a steel cathode and an aluminium anode, their prototype battery did produce a trickle of current - until the electrodes succumbed to corrosion ([ECS Transactions](#), DOI: [10.1149/1.2838188](#)).

This unpromising start has inspired fresh attempts, however, including a concrete zinc-carbon battery created by a team at the State University of New York at Buffalo. The anode of their three-layered concrete composite contains carbon black and zinc powder while the cathode contains carbon black and manganese dioxide powder (see diagram). The idea is that these finely dispersed materials improve electrical connectivity between the electrodes and the electrolyte, and this works, up to a point. Tests show their battery's storage capacity is still minuscule - just microwatt-hours per kilogram - but the researchers say that adding salts or polymers to tune electronic and ionic conductivity should improve its performance ([Cement and Concrete Composites, vol 32, p 829](#)).

Considering that the average American house contains over 12 tonnes of concrete and a small office block might use a thousand times more, concrete batteries would seem to offer huge capacity for electrical storage, particularly in off-grid buildings, as emergency back-up supplies for businesses or for smoothing the output from roof-mounted photovoltaic panels. For now, though, you are more likely to be plugging in to your wallpaper than to the wall behind it. Paper-thin batteries are already highly desirable for powering circuitry in everything from electronic newspapers to the ultimate geek chic: clothing with gadgets like phones and music-players built in.

Shreefal Mehta thinks that paper itself holds the key. Mehta runs the Paper Battery Company based in Troy, New York, and is working towards electricity-storing sheets that will not only squeeze into places that conventional batteries can't reach - thin gaps in cellphone casings, say - but which could also replace paper and thin plastic in almost any situation where electricity storage would be a bonus.

Electric origami

His battery is based on research by a team at Rensselaer Polytechnic Institute (RPI), also in Troy, that showed it is possible to store energy in a sheet of cellulose. The team embedded a carbon-nanotube array into each side of a cellulose sheet that had been soaked in an ionic liquid. The nanotubes formed the electrodes, while the ionic liquid, dispersed in pores within the cellulose, acted as an electrolyte. Their material successfully stored around 10 watt-hours per kilogram - in other words, a dozen A4 sheets of the stuff would supply about the same energy as a typical AAA-battery ([Proceedings of the National Academy of Sciences, vol 104, p 13574](#)).

Though Mehta declined to reveal much about the material his company is developing, dubbed the PowerWrapper, he says their trick has been to formulate the different components into a printable ink so that they can create a battery by printing the layers sequentially. This allows them to create both supercapacitors and batteries with high energy-density that can be produced using a high-speed roll-to-roll manufacturing process. Mehta plans to commercialise his paper batteries in the next two years. "We're already in discussions with customers who are testing our prototype devices," he says.

Ultimately, the company envisages integrating their paper battery into the cover or lining of laptop cases, into car interiors and homes. A PowerWrapper sheet could do the job of a conventional membrane laid under the roof or fixed to exterior or interior walls, while also allowing you to store renewable energy from photovoltaic panels or turbines for times when the sun isn't shining or the wind doesn't blow. "You could wrap it around any structure," says Pulickel Ajayan, who helped develop the material at RPI.

So tread lightly on that concrete path. Close your laptop's lid with care. We may not wave goodbye to AA-batteries and their ilk for some while yet, but in the meantime let's show the everyday materials of modern life the respect they will soon deserve.

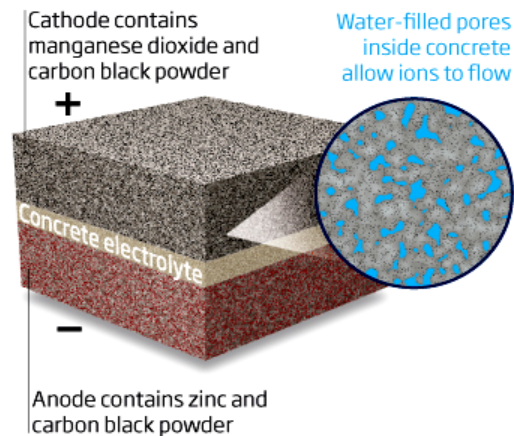
James Mitchell Crow is a science writer based in Melbourne, Australia

Materials in charge

Though prototype structural batteries can't yet match conventional devices for capacity, there are several innovative designs that could one day do the job

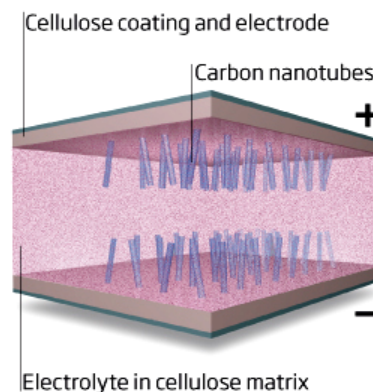
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Concrete battery

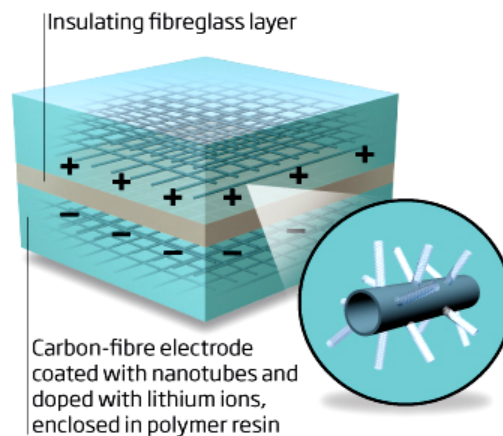


Paper battery

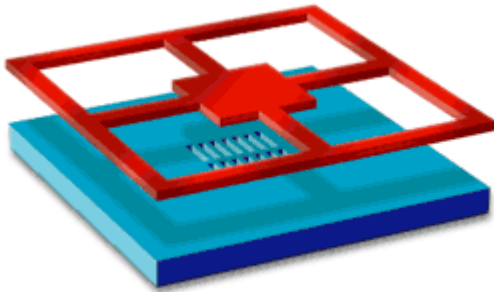
Ions can move through electrolyte inside pores within the cellulose matrix



Plastic composite supercapacitor



Spherical Casimir Pistons



J S Dowker, 2011 *Class. Quantum Grav.* 28 155018 (8pp)

Abstract: <http://iopscience.iop.org/0264-9381/28/15/155018>

Full paper: [http://iopscience.iop.org/0264-9381_28_15_155018.pdf](http://iopscience.iop.org/0264-9381/28/15/155018/pdf/0264-9381_28_15_155018.pdf)

A piston is introduced into a spherical lune Casimir cavity turning it into two adjacent lunes separated by the (hemispherical) piston. On the basis of zeta-function regularization, the vacuum energy of the arrangement is finite for conformal propagation in spacetime.

For even spheres this energy is independent of the angle of the lune. For odd dimensions it is shown that for all Neumann, or all Dirichlet, boundary conditions the piston is repelled or attracted by the nearest wall if $d = 3, 7, \dots$ or if $d = 1, 5, \dots$, respectively.

For hybrid N-D conditions these requirements are switched. If a mass is added, divergences arise which render the model suspect. The analysis, however, is relatively straightforward and involves the Barnes zeta function. The extension to finite temperatures is made and it is shown that for the $3, 7, \dots$ series of odd spheres, the repulsion by the walls continues but that, above a certain temperature, the free energy acquires two minimal symmetrically placed about the midpoint.

Ed. Note: The continuous movement of this microscopic Casimir oscillator based on the temperature and dimensional design is due to the quantum vacuum energy in the cavity. This is a theoretical proof of the feasibility of a working mechanical motor or pump powered by the quantum vacuum since the repulsive and attractive Casimir forces are only due to cavity design parameters. See "*Practical Conversion of Zero-Point Energy from the Quantum Vacuum*" by T. Valone for more information and explanation.

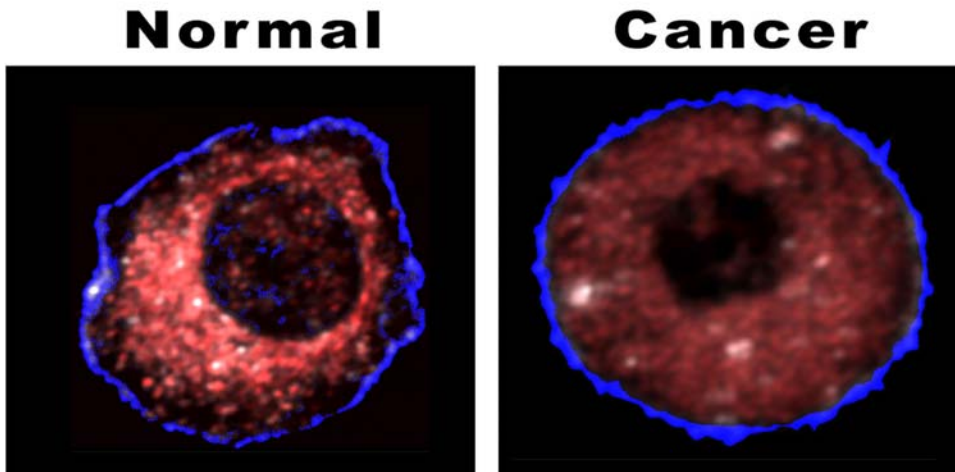
Cancer Craves Killer Free Radicals

[Linda Geddes](#), New Scientist [2830](#). September 15, 2011

Ed. Note: *It is interesting that antioxidants to fight free radicals is becoming more important. IRI has discovered "electronic antioxidants" are even more effective than pills. Our new webpage: www.BioenergyDevice.org describes a very effective electrotherapy unit available from IRI that produces electronic antioxidants. - TV*

FOR 80 years we have misunderstood the feeding habits of cancer. It's a controversial suggestion that, if correct, could open up a host of alternative ways to fight the killer disease, and may even mean that in some circumstances chemotherapy drugs promote tumour growth rather than inhibit it. In the 1930s, Otto Warburg suggested that cancer cells produce the bulk of their energy by breaking

down glucose in the absence of oxygen, a process called glycolysis. The [Warburg effect](#), as it is called, is now widely accepted in cancer research. It is also incorrect, according to Michael Lisanti at the Kimmel Cancer Center in Philadelphia, Pennsylvania.



Lisanti thinks that when a cell turns cancerous it begins to spew out hydrogen peroxide. The free radicals this generates cause oxidative damage that prompts support cells in the connective tissue around the cancer cells to begin digesting themselves ([see diagram](#)). Once these support cells, called fibroblasts, have consumed the mitochondria that normally provide their energy, they switch to glycolysis. The cancer cells then feed off the nutrients glycolysis generates.

"It's the Warburg effect, but in the wrong place," says Lisanti, who presented the idea earlier this month at the [Strategies for Engineered Negligible Senescence](#) meeting in Cambridge, UK. "Cancer cells can feed off normal cells as a parasite." In fact, he says, cells infected with malaria behave in much the same way. "The malaria parasite enters cells, induces oxidative stress, and gets free food" by feeding off the structures inside host cells that self-digest as a result of the stress.

"The importance of the [micro-environment](#) is something that has been gaining recognition over the last few years," says [Nic Jones](#) of the Paterson Institute in Manchester, and chief scientist for Cancer Research UK. "This adds a very important and exciting twist, where the communication between the cancer cell and the fibroblast fuels the development of the tumour."

This form of "metabolic coupling" also mirrors the way in which the epithelial cells that make up the skin and the surface of the body's organs produce hydrogen peroxide during [wound healing](#). In doing so they rally immune cells to repair the damage - but in cancer the signal is never turned off. "Cancer is a wound that doesn't heal, because it keeps on producing hydrogen peroxide," says Lisanti.

He has experimental data to support his radical idea. When his team cultured breast cancer cells alongside fibroblasts for five days, they spotted the cancer cells releasing hydrogen peroxide on day two. By day five, most free radicals generated by the hydrogen peroxide were found inside the fibroblasts (*Cell Cycle*, [DOI: 10.4161/cc.9.16.12553](#)). The team also found a reduction in mitochondrial activity in fibroblasts, consistent with the cells self-destructing. There was also an increase in glucose uptake by the fibroblasts - a sign of glycolysis (*Cell Cycle*, [DOI: 10.4161/cc.10.15.16585](#)).

Lisanti is now gathering evidence to find out whether his ideas can be applied to many cancers or just a few. He has discovered a "marker" to identify patients in whom the metabolic coupling is occurring: as the fibroblasts are destroyed they stop producing a protein called caveolin-1. Lisanti has recorded a drop in caveolin-1 levels in 40 to 50 per cent of patients with breast cancer, and loss of the protein correlates with early tumour recurrence, metastasis, and resistance to the drug, tamoxifen (*Breast Cancer Research*, [DOI: 10.1186/bcr2892](#)). He also has evidence for caveolin-1 loss in prostate cancer. Those results suggest that new cancer therapies based around Lisanti's ideas might be possible ([see "The cells that die so cancer can live"](#)).

Lisanti believes the reason Warburg got it wrong is because he looked at cancer cells in isolation, rather

than in co-culture with fibroblasts.

"The provocative use of the term 'reverse Warburg' is certainly catchy," says [Chi Van Dang](#) of Johns Hopkins University in Baltimore, Maryland - but it ignores some important observations. For example, many previous studies have found increased glycolysis in cancer cells.

Lisanti's model also runs into problems when taking the long view. "If these [fibroblasts] are sacrificing themselves so that the cancer can eat, sooner or later they are going to be completely depleted. And that doesn't happen," says [Ian Hart](#) of Barts Cancer Institute in London, UK. It is possible that tumours recruit stem cells from the bone marrow to replace the fibroblasts, but Hart says more evidence is needed to confirm this.

However, if Lisanti is correct, his ideas could also explain why people become more susceptible to cancer as they age. More than 100 years ago, Steven Paget proposed that cancer cells are seeds that need the correct micro-environment in which to grow. "What we're now saying is that the hydrogen peroxide is the fertiliser," says Lisanti. "As you age, your body produces more hydrogen peroxide and free radicals and becomes a fertile ground for cancer."

The cells that die so cancer can live

For decades, cancer therapies have focused on destroying cancer cells and ignored the healthy cells tumours also contain. The discovery that cancer cells form a parasitic relationship with the "nest" of fibroblasts or support tissue that surrounds the tumour may therefore open up other opportunities for treating the disease.

"So far, all mainstream cancer therapies are aimed at [removing] these transformed cells," says Ian Hart of Barts Cancer Institute in London, UK. "Rather than killing every last tumour cell, let's modify the [fibroblasts]."

In his model, Michael Lisanti at the Kimmel Center in Philadelphia, Pennsylvania, proposes that cancer cells use hydrogen peroxide to strike up their metabolic relationship with the fibroblasts. The chemical generates free radicals in the fibroblasts, kick-starting a self-digestion process which frees up nutrients to fuel cancer growth. His team found that treating cancer cells with catalase, an enzyme that destroys hydrogen peroxide, triggered a fivefold increase in cancer cell death, possibly by cutting off the cells' fuel supply.

This raises the prospect of treating cancer with [antioxidants](#), which mop up free radicals. However, although some studies hint that antioxidants may be beneficial, particularly for cancer prevention, the results have often been disappointing, says Hart.

Killer free radicals

Lisanti thinks that's because most chemotherapies work by generating lethal doses of free radicals to kill the cancer cells, which would cancel out the effects of any antioxidant treatments. He believes we need trials of antioxidants alone, rather than in combination with chemotherapy.

If he is correct it is also possible that in some situations, chemotherapy might [help cancer spread](#) by making more fuel available to the cancer cells.

"Conventional chemotherapy saved my father from colon cancer, but when it does not work, you get recurrence and metastasis," says Lisanti. "There is a lot of luck involved here, ensuring that you got just the right dose."

Hart believes a more promising approach might be to target specific molecules that enable cross-talk between cancer cells and fibroblasts.

One possibility is using drugs that block "autophagy", the process by which the fibroblasts self-digest and release nutrients that then fuel cancer growth. The malaria drug, chloroquine, works in this way, so could also be tested against cancer, says Lisanti.

Drugs that inhibit the ability of mitochondria to burn lactate and other products of glycolysis may also serve to cut off the tumour's food supply. One such drug is metformin, widely prescribed to treat diabetes. Indeed, several recent studies have suggested that people taking metformin have a reduced risk of developing cancer (*Gastroenterology*, [DOI: 10.1053/j.gastro.2009.04.013](#)).

For similar stories, visit the [Cancer](#) Topic Guide.

Pulsed Electro-Magnetic Fields (PEMF) Four Year Study by NASA

May 22, 2011 // by drashoksinghal100

<http://www.pemftreatmenthealingtouches.com/pulsed-electro-magnetic-field-pemf-4year-study-by-nasa/>

Ed. Note: Dr. Glen Gordon, a former COFE speaker, was highly influenced to develop the "EM-Pulse" technology that IRI still sells, based on the preliminary results of this NASA study. The product may be redesigned for future sales since the quantity is limited. - TV

NASA 4-year collaborative study on the efficacy of electromagnetic fields to stimulate growth and repair in mammalian tissues has definitive results according to CHIEF INVESTIGATOR: Thomas J. Goodwin, Ph.D. Lyndon B Johnson Space Center.



Glen Gordon, MD, EM Pulse PEMF Device

PURPOSE: This four year study used human donors "to define the most effective electromagnetic fields for enhancing growth and repair in mammalian tissues."

To utilize "nerve tissue which has been refractory to efforts to stimulate growth or enhance its repair regardless of the energy used." (all other tissues have demonstrated growth and repair stimulation with appropriate PEMF). To define a PEMF technology that would "duplicate mature, three dimensional morphology between neuronal cells

and feeder (glial) cells, which has not been previously accomplished."

RESULTS: The PEMF used in the study "caused accelerated growth rate and better organized morphology over controls", and resulted in "greater cell viability" (85% vs. 65%). In the gene discovery array (chip technology that surveyed 10,000 human genes), the investigators found up-regulation of 150 genes associated with growth and cell restoration. T. Goodwin (personal communication): "PEMF shut down each dysregulatory gene we studied".

NASA's CONCLUSION:

"The up-regulation of these genes is in no manner marginal (1.7-8.4 logs) with genesites for collagen production and growth the most actively stimulated. We have clearly demonstrated the bioelectric/biochemical potentiation of nerve stimulation and restoration in humans as a documented reality. The most effective electromagnetic field for repair of trauma was square wave with a rapid rate of change (dB/dt) which saw cell growth increased up to 4.0times. They further noted that "slowly varying (millisecond pulse, sine wave) or nonvarying DC (CW lasers, magnets) had little to no effect."

Final Recommendation: "One may use square wave EM fields with rapid rate of change for: 1) repairing traumatized tissues, 2) moderating some neurodegenerative diseases 3) developing tissues for transplantation."

PEMF PROVIDES: greater cell viability; accelerated cell growth-better organized cell morphology. upregulation of genesrelated to collagen production; up regulation of genes related to cell restoration and growth- bioelectric potentiation of nerve stimulation and restoration- high-speed square wave increasedcell growth four-times faster.

For More Information:

NASA study paper <http://ston.jsc.nasa.gov/collections/TRS/techrep/TP-2003-212054.pdf>
<http://www.integrityresearchinstitute.org/catalog/bioelectric.html>

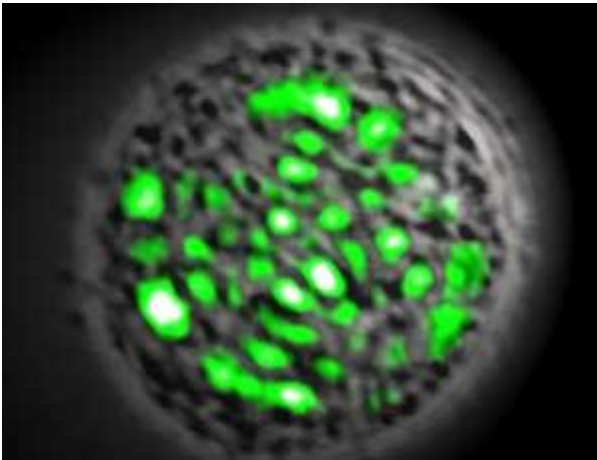
*the first study to clarify technologies and efficacy parameters for tissue growth and restoration

First Human Living Laser

Ferris Jabr, New Scientist, 12 June 2011

<http://www.newscientist.com/article/dn20563-first-living-laser-made-from-kidney-cell.html>

Ed. Note: The discovery of the first human cellular laser proves to the bioelectromagnetics practitioner that light is not only "compatible" with endogenous cellular metabolism but the orders of magnitude increase in the energy density of visible light from the lasing cavity inside the cell is also tolerable and therapeutic to the cell. See the reference book, [Bioelectromagnetic Healing](#) by T. Valone for a scientific explanation of "light therapy" and details on how electromagnetic fields of all frequencies interact with human tissue.



The human kidney cell that was used to make the laser survived the experience. In future such "living lasers" might be created inside live animals, which could potentially allow internal tissues to be imaged in unprecedented detail.

It's not the first unconventional laser. Other attempts include lasers made of Jell-O and powered by nuclear reactors (see Related Information box below). But how do you go about giving a living cell this bizarre ability?

Typically, a laser consists of two mirrors on either side of a gain medium - a material whose structural properties allow it to amplify light. A source of energy such as a flash tube or electrical discharge excites the atoms in the gain medium, releasing photons. Normally, these would shoot out in random directions, as in the broad beam of a flashlight, but a laser uses mirrors on either end of the gain medium to create a directed beam.

As photons bounce back and forth between the mirrors, repeatedly passing through the gain medium, they stimulate other atoms to release photons of exactly the same wavelength, phase and direction. Eventually, a concentrated single-frequency beam of light erupts through one of the mirrors as laser light.

Alive and well

Hundreds of different gain media have been used, including various dyes and gases. But no one has used living tissue. Mostly out of curiosity, Malte Gather and Seok-Hyun Yun of Harvard University decided to investigate with a single mammalian cell.

They injected a human kidney cell with a loop of DNA that codes for an enhanced form of green fluorescent protein. Originally isolated from jellyfish, GFP glows green when exposed to blue light and has been invaluable as a biological beacon, tracking the path of molecules inside cells and lighting up when certain genes are expressed.

After placing the cell between two mirrors, the researchers bombarded it with pulses of blue light until it began to glow. As the green light bounced between the mirrors, certain wavelengths were preferentially amplified until they burst through the semi-transparent mirrors as laser light. Even after a few minutes of lasing, the cell was still alive and well.

Christopher Fang-Yen of the University of Pennsylvania, who has worked on single-atom lasers but was not involved in the recent study, says he finds the new research fascinating. "GFP is similar to dyes used to make commercial dye lasers, so it's not surprising that if you put it in a little bag like a cell and pump it optically you should be able to get a laser," he says. "But the fact that they show it really works is very cool."

Internal imaging?

Yun's main aim was simply to test whether a biological laser was even possible, but he has also been mulling over a few possible applications. "We would like to have a laser inside the body of the animal, to generate laser light directly within the animal's tissue," he says.

In a technique called laser optical tomography, laser beams are fired from outside the body at living tissues. The way the light is transmitted and scattered can reveal the tissues' size, volume and depth, and produce an image. Being able to image from within the body might give much more detailed images. Another technique, called fluorescence microscopy, relies on the glow from living cells doped with GFP to produce images. Yun's biological laser could improve its resolution with brighter laser light.

To turn cells inside a living animal into lasers, they would have to be engineered to express GFP so that they were able to glow. The mirrors in Yun's laser would have to be replaced with nanoscale-sized bits of metal that act as antennas to collect the light.

"Previously the laser was considered an engineering material, and now we are showing the concept of the laser can be integrated into biological systems," says Yun. The living laser is a first, but other strange lasers have been made in the half-century since Theodore Maiman made the first such device from a fingertip-sized ruby rod. On 16 May 1960, Maiman blasted the ruby with a brilliant burst of light from a photographic flash lamp, generating a bright red beam.

About a decade later, two future Nobel laureates created the first edible laser - well, almost. Theodor Hänsch and Arthur Schawlow tried 12 flavours of Jell-O dessert before settling on an "almost non-toxic" fluorescent dye. When added to unflavoured gelatin, this yielded a bright laser beam when illuminated with UV light. Schawlow, who had snacked on the failures, gave the successful one a miss. Around the same time, NASA wanted much more powerful lasers for beaming power into space, and proposed powering these by exciting molecules with fragments from nuclear fission inside a small reactor. Pulses of up to 1 kilowatt were achieved before NASA abandoned the programme. The so-called Star Wars programme of the Reagan era later funded a project to develop reactor-powered laser weapons, but they never got off the ground.

Much more recently, in 2009, the world's smallest laser was demonstrated at the University of California, Berkeley. It generated green laser light in strands of cadmium sulphide only 50 nanometres across, 1/10th of the wavelength of the light it emitted. And don't forget the anti-laser, from Hui Cao's lab at Yale University. Instead of emitting light, the anti-laser soaks it up. Strange as it sounds, it may have a practical use: converting optical signals into electrical form for future communication links. Jeff Hecht

.RELATED ARTICLE

[Nature Photonics, DOI: 10.1038/nphoton.2011.99](https://doi.org/10.1038/nphoton.2011.99)

A Moving Mirror Can Generate Light from the Vacuum



By Geoff Brumfiel, <http://www.nature.com/news/>

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<http://www.scientificamerican.com/article.cfm?id=moving-mirrors-make-light-from-nothing>

Ed Note: Learn even more neat quantum vacuum engineering tricks of the trade in the classic text: [Practical Conversion of the Quantum Vacuum](#) by Thomas Valone or alternatively, [Zero Point Energy: The Fuel of the Future](#) by Thomas Valone. Also notable is the RejuvaMatrix invention by Dr. Norm Shealy which also affects DNA telomeres with an even higher electron oscillation frequency of several billion times per second, predictably generating light in the human body as well to cause the effect. - TV

A team of physicists is claiming to have coaxed sparks from the vacuum of empty space¹. If verified, the finding would be one of the most unusual experimental proofs of quantum mechanics in recent years and "a significant milestone", says John Pendry, a theoretical physicist at Imperial College London who was not involved in the study.

The researchers, based at the Chalmers University of Technology in Gothenburg, Sweden, will present their findings early next week at a [workshop](#) in Padua, Italy. They have already posted a paper on the popular pre-print server arXiv.org, but have declined to talk to reporters because the work has not yet been peer-reviewed. High-profile journals, including Nature, discourage

researchers from talking to the press until their findings are ready for publication.

Nevertheless, scientists not directly connected with the group say that the result is impressive. "It is a major development," says Federico Capasso, an experimental physicist at Harvard University in Cambridge, Massachusetts, who has worked on similar quantum effects.

At the heart of the experiment is one of the weirdest, and most important, tenets of quantum mechanics: the principle that empty space is anything but. Quantum theory predicts that a vacuum is actually a writhing foam of particles flitting in and out of existence.

The existence of these particles is so fleeting that they are often described as virtual, yet they can have tangible effects. For example, if two mirrors are placed extremely close together, the kinds of virtual light particles, or photons, that can exist between them can be limited. The limit means that more virtual photons exist outside the mirrors than between them, creating a force that pushes the plates together. This 'Casimir force' is strong enough at short distances for scientists to physically measure it.

<http://agenda.infn.it/internalPage.py?pagelId=12&confId=3343>

From virtual to real

For decades, theorists have predicted that a similar effect can be produced in a single mirror that is moving very quickly. According to theory, a mirror can absorb energy from virtual photons onto its surface and then re-emit that energy as real photons. The effect only works when the mirror is moving through a vacuum at nearly the speed of light - which is almost impossible for everyday mechanical devices.

Per Delsing, a physicist at the Chalmers University of Technology, and his colleagues circumvented this problem using a piece of quantum electronics known as a superconducting quantum interference device (SQUID), which is extraordinarily sensitive to magnetic fields.

The team fashioned a superconducting circuit in which the SQUID effectively acted as a mirror. Passing a magnetic field through the SQUID moved the mirror slightly, and switching the direction of magnetic field several billion times per second caused it to 'wiggle' at around 5% the speed of light, a speed great enough to see the effect.

The result was a shower of microwave photons shaken loose from the vacuum, the team claims. The group's analysis shows that the frequency of the photons was roughly half the frequency at which they wiggled the mirror - as was predicted by quantum theory.

Capasso calls the experiment "very clever". He doubts that the effect has any practical use because it doesn't generate large numbers of photons, but he considers it a nice demonstration of quantum mechanics. He still hopes to see a moving piece of metal generate detectable light from the vacuum, and believes that micromechanical systems may eventually be able to reach such speeds.

Pendry says that the result, if it stands up, is bound to generate excitement. "Work in this area stirs considerable passion in the breasts of physicists."

References

1. Wilson, C. M. et al. Preprint at <http://arxiv.org/abs/1105.4714>

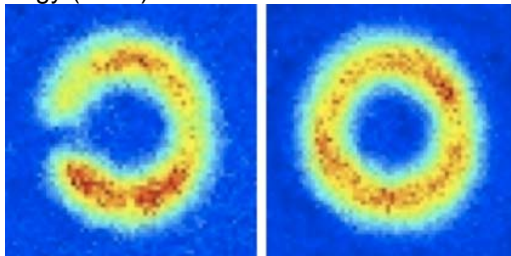
Atomic Superconductor One-Ups SQUID

R. Colin Johnson EE Times, 4/1/2011 7:10 PM EDT

<http://www.eetimes.com/electronics-news/4214699/Atomic-superconductor-one-ups-squid>

Ed. Note: Perpetual motion is described in this article as a persistent current, which historically has been sustained for years in ring superconductors, so the record here is for atomic versions of it. - TV

Circulating ultra-cold atoms around a ring exhibits superfluidity-the atomic version of superconductivity-potentially enabling sensors capable of tracking rotational motion in gyroscopes of unparalleled accuracy, according to the National Institute of Standards and Technology and Technology. PORTLAND, Oregon. Circulating ultra-cold atoms around a ring exhibits superfluidity-the atomic version of superconductivity-potentially enabling sensors capable of tracking rotational motion in gyroscopes of unparalleled accuracy, according to the National Institute of Standards and Technology and Technology (NIST).



When gases are cooled to near absolute zero, they condense into a superfluid that can be launched around a ring to exhibit perpetual motion, similar to the manner in which superconducting quantum interference devices (squids) detectors circulate electrons around a superconducting ring. Such atomic Squids could enable ultra-precise gyroscopes the size of micro-electro-mechanical systems.

NIST researchers cooperated with the University of Maryland on the world's first atom-circuit formed by a loop of atoms in a superfluidic state which can be switched on and off with a laser controlled barrier. The research team was able to demonstrate perpetual motion-called persistent current-for a record-setting 40 seconds.

NIST said it was working toward a future atomtronics era where all circuit components would be based on atomic-scale mechanisms that can harness quantum effects to create superconductors, superinsulators and now superfluidic devices.

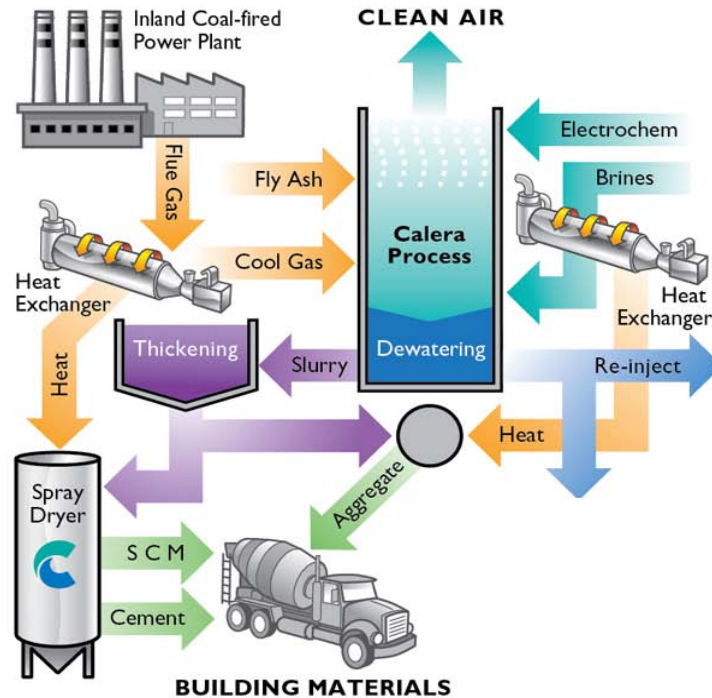
New Process for Sequestering CO2

Calera Press Release, May, 2011

<http://calera.com/>

Calera process for coal to fresh air and water

It recycles waste products, produces fresh water and, wait for it, captures and sequesters carbon and other pollutants. Safely. No pipes to the bottom of the ocean, no betting on the thermocline, no liquefaction and deep earth burial (although Calera can do that too).



The CO₂ is recycled along with fly ash, wastewater and brines from manufacturing and desalination. Calera's process remixes the ingredients and outputs fresh water and cement. Using waste materials to produce cement means not having to mine limestone. Meanwhile, pollutants like sulfur oxides, mercury and CO₂ are captured, purifying the flue gas emitting from power and cement plants and preventing acid rain.

Tour Calera's prototype factory for turning CO₂ into cement.

http://www.greentechmedia.com/multimedia/gtm_calera/

Innovative cement helps DOE safeguard Nuclear

http://www.anl.gov/Media_Center/News/2008/ES080425.html

So all that concrete in paradise will, in fact, protect paradise. Concrete produced via Calera's process will mean less brines from desalination, less water used for carbon sequestration, less limestone mining, less carbon, mercury and sulfur oxides in the environment, less global warming, and more environmental stability.

Maybe using better concrete doesn't match leaving paradise untouched, but in light of arguably necessary economic development, Calera's process is the next best thing.

For More Tech Info:

Scientific Synthesis of Calera Carbon Sequestration and Carbonaceous By-Product Applications

http://www.igsd.org/climate/documents/Synthesis_of_Calera_Technology_Jan2011.pdf

Electrostatic Motors You Can Build

By C.P. Gilmore & William J. Hawkins, Reprint of *Popular Science* article (May 1971)

<http://www.popsoci.com/archive-viewer?id=ngAAAAAAMBAJ&pg=95&query=may+1971+electrostatic+motors>

Ed. Note: This article and others are included in the new edition of [Electrostatic Motors: Their History, Types and Principles of Operation by Oleg Jefimenko](#), just released by Integrity Research Institute publishers in 2011.

In "The Amazing Motor That Draws Power From the Air", last month, we told about our visit to the laboratory of Dr. Oleg Jefimenko at the University of West Virginia, who has designed and built a variety of these ingenious machines now, as promised, we bring you details on how you can build your own electrostatic motor from simple materials.

The devices that you see here are corona-discharge motors. The sharp-pointed or knife-edge electrodes create a corona, which ionizes or charges the air particles floating by. These charged particles transfer their charge to the closest part of the plastic rotor and charge it up, just as you can charge your body by walking across a wool rug on a dry winter's day.

Once a spot on the rotor assumes a charge, it is repelled from the charging electrode by electrostatic forces, and at the same time is attracted to the other electrode, which has an opposite charge. When the charged section of the rotor reaches the opposite electrode, another corona discharge reverses the polarity and starts the whole thing over again.

The Concept is Simple

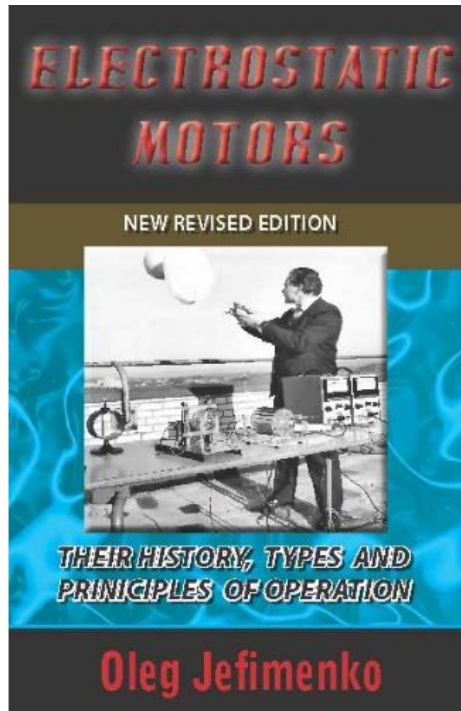
And so are the motors. But that doesn't mean they're easy to build. These motors run on millionths of a watt; they've got no power to waste turning stiff bearings or slightly misaligned rotors. So they must be built with watch-making precision.

They're made of acrylic sheet, rod, and tube stock -- Plexiglas and Lucite are two of the better-known brands. Acrylic cuts and works beautifully. Cut edges can be sanded so they have a white, frosted appearance that, in contrast with clear surfaces, gives your finished motor a sparkling, jewel-like appearance. If you like clear edges, you can buff them on a wheel and the whole thing becomes transparent.

Drill and tap the acrylic and assemble parts with machine screws. This allows for fine adjustment and alignment. Later, you can make the whole thing permanent by putting a little solvent along the joints. The solvent flows into the joint and fuses it permanently.

Details of framework, support and so on aren't important; change them if you like. but work with care if you want to avoid headaches. The Pogendorff motor looked simple; we

slapped it together in a couple of hours, hooked up the power source -- and nothing happened. We gave it a few helpful spins by hand, but it wouldn't keep running.



The cure took about 3 hours. First, we noticed that the outer edge of the disk wobbled from side to side about 1/16 of an inch as the wheel revolved. So the rotor-electrode distance was constantly changing. There was a little play in the 1/4" hole we had drilled for the electrodes -- so they weren't lined up absolutely square with the disk. Then we noticed that the disk always stopped with one side down. The imbalance was only a fraction of an ounce -- but it was too much.

We drilled out the old hub and cemented in a new one -- this time, carefully. We lined up the electrodes -- precisely. Then, once more spinning the disk by hand, we added bit of masking tape until it was perfectly balanced. We connected the power -- and slowly... slowly... the disk began to turn. After about a minute, we clocked some turns with a watch and found it was spinning at 200 rpm. A moment later, we lost count. It was a great feeling.

Where Tolerances Are Brutal

We had even more trouble with the octagonal-window machine. When it wouldn't run and we turned the shaft by hand, we could feel the rotor dragging. We took it apart, felt all the surfaces on the rotor and the framework's insides and found a few bits of hardened cement, which we removed. We filed down all edges on the rotor and the windows to make sure there were no beads or chips dragging.

The rotor and corner separators are made from the same sheet of 1/2" plastic, so rotor clearance is achieved by putting shims at the corners to hold the side plates slightly more than 1/2" apart. With the 1/16" shims we were using, we could see that the sides were slightly misaligned so the shaft was not being held at a true 90 degrees. We drilled slightly oversized holes in the corners of one side piece and carefully adjusted until the rotor was turning true in the slot. To give the motor more torque, we put a bead of cement along the outer edge of each aluminum-foil electrode to stop corona leakage. The motor ran.

Take a Giant Step

Once you've built these machines, why not design your own? Start with the Jefimenko

1/10 hp model as a challenge. Then plan one from scratch. You can power your motors with a laboratory high-voltage supply, a Van de Graff generator, or a Wimhurst machine or any other high-voltage source. We've been running ours on the home-built Wimhurst machine shown in the photos. (If you don't want to build one, Wimhurst machines are available from scientific supply houses such as Edmund Scientific.) (<http://www.scientificsonline.com/catalogsearch/result/?q=wimhurst> - Ed. Note.)

The discharge globes are traditional for high-voltage machines. They aren't necessary, but they give a quick check on machine operation and a satisfying arc when you move them within 1/2" of each other. Incidentally, that funny smell is ozone. But its concentration is too low to be harmful. The generator is safe, too. You can hold both electrodes in your hands and all you'll feel is a tingle. This particular generator, we estimate, puts out about 30,000 volts.

To make wiring simple, we used standard connectors on the Wimhurst collectors, and meter leads with regular banana plugs and alligator clips to hook up the motors. Last month, we mentioned seeing Dr Jefimenko run his electrostatic motors on electricity tapped from the earth's field. We haven't had a chance to try this yet with ours, but it should work. If you want to try, you'll need a needle-pointed piece of music wire a few inches long to start a corona, plus several hundred feet of fine copper wire.

Connect the pointed wire to the fine conductor, get the sharp point up into the air at least 200-300 feet with a kite or balloon, and hook the wire to one side of the motor. Hook the other side of the motor to ground. The earth field antenna should at times be able to develop up to 20,000 volts from the earth's electrical field. If nothing happens, check your equipment, or try another day. The field changes constantly.

When we crank up the electrostatic motor at the end of this article, people always want to know what makes it run. It is mysterious -- there's nothing but a plastic disk and two strange electrodes. Yet there it is, spinning merrily.

For More Information:

<http://www.integrityresearchinstitute.org/catalog/engineeringBooks.html>

http://www.amazon.com/Electrostatic-Motors-History-Principles-Operation/dp/1935023470/ref=sr_1_3?s=books&ie=UTF8&qid=1301088036&sr=1-3

The Difference Engine, Nikola Tesla's Revenge

Apr 1st 2011, 9:36 by N.V. | LOS ANGELES http://www.economist.com/blogs/babbage/2011/04/induction_motors&fsrc=n



ONCE again, worrywarts in Washington are wringing their hands over possible shortages of so-called "critical materials" for America's high-tech industries. In particular, the **Department of Energy** frets about certain metals used in manufacturing wind turbines, electric vehicles, solar cells and energy-efficient lighting. The substances in question include a bunch of rare-earth metals plus a handful of other elements which-used a pinch here, a pinch there-enhance the way many industrial materials perform.

It is not as though the rare-earth elements-scandium, yttrium and lanthanum plus the 14 so-called lanthanides-are all that rare. Some are as abundant as nickel, copper or zinc. Even the two rarest (thulium and lutetium) are more widely spread throughout the Earth's crust than gold or platinum. But because they have similar chemical properties, and tend to be lumped together in rocks along with radioactive thorium and uranium, extracting and refining them can be difficult, expensive and messy. Disposing of the toxic waste is one of the biggest headaches.

A decade ago, America was the world's leading producer of the rare-earth metals. But its huge open-cast mine at Mountain Pass, California, closed in 2002-a victim of China's much lower labour costs, America's increasingly stringent environment rules, and delays in renewing the mine's operating license. Today, China produces 97% of the world's supply of rare-earth metals-a by-product of the country's vast iron-ore mining operations in **Inner Mongolia**. Over the past year, the Chinese authorities have cut back drastically on exports of rare-earths, as China's own high-tech industries absorb more of the output (see "More precious than gold", September 17th 2010).

The rare-earth the **Department of Energy** seems particularly paranoid about is neodymium. This is widely used for making super-strong permanent magnets. Over the past year, the price of neodymium has quadrupled, as electric motors and generators that use permanent magnets instead of electromagnetic windings in their rotors have proliferated. Cheaper, smaller and more powerful, permanent-magnet machines have been one of the main factors behind the increasing popularity of wind turbines and electric vehicles. That said, not all makers of electric vehicles have rushed to embrace permanent-magnet motors. For one, the **Tesla Roadster**, an electric sports car

based on the Lotus Elise, uses no rare-earth metals whatsoever. Nor does the Mini-E, an electric version of BMW's recreation of the iconic 1960s car. Meanwhile, the company that pioneered much of today's electric-vehicle knowhow, **AC Propulsion** of San Dimas, California, has steered clear of permanent-magnet technology. More recently, **Continental AG**, a German car-components firm, has developed an electric motor for a forthcoming European electric vehicle that likewise uses no rare-earths. Clearly, a growing number of car companies think the risk of depending on a single (and not so reliable) source of rare-earth metals is too high.

The latest carmaker to seek a rare-earth alternative is Toyota. The world's largest carmaker is developing a neodymium-free electric motor for its expanding range of hybrid cars. Following in AC Propulsion's footsteps, Toyota has based its new design on industry's electromotive mainstay, the cheap and rugged alternating-current induction motor patented by Nikola Tesla, an American inventor, back in 1888.

Tesla's invention is, in essence, a rotating transformer. Its primary windings reside in a stationary steel casing (the stator) and secondary conductors are attached to an inner shaft (the rotor). The stator surrounds-but does not touch-the rotor, which is free to rotate about its axis. An alternating current applied to the stator's windings creates a rotating magnetic field, while simultaneously inducing a current in the separate conductors attached to the rotor. With an alternating current now circulating within it, the rotor creates a rotating magnetic field of its own, which then proceeds to chase the stator's rotating field-causing the rotor to spin in the process and thereby generate torque.

Modern induction motors usually have three (or more) sets of stator windings, each using a different phase of the alternating current being applied. Having three "waves" of magnetism induced in the rotor with every revolution, instead of just one, smooths out the induction process and allows more torque to be generated.

Such machines are known as asynchronous motors, because the rotor's magnetic field never catches up with the stator's field. That distinguishes them from synchronous motors that use a permanent magnet in their rotors instead of a set of aluminium or copper conductors. In a synchronous motor, the stator's rotating magnetic field imposes an electromagnetic torque directly on the fixed magnetic field generated by the rotor's permanent magnet, causing the rotor-magnet assembly to spin on its axis in sync with the stator field. Hence the name.

In the past, the main disadvantage of asynchronous induction motors was the difficulty of varying their speed. That is no longer an issue, thanks to modern semiconductor controls. Meanwhile, the induction motor's big advantage-apart from its simplicity and ruggedness-has always been its ability to tolerate a wide range of temperatures. Providing adequate cooling for the Toyota Prius's permanent-magnet motor adds significantly to the vehicle's weight. An induction motor, by contrast, can be cooled passively-and thereby dispense with the hefty radiator, cooling fan, water pump and associated plumbing.

Better still, by being able to tolerate temperatures that cause permanent magnets to break down, an induction motor can be pushed (albeit briefly) to far higher levels of performance-for, say, accelerating hard while overtaking, or when climbing a steep hill. Hybrid vehicles like the Toyota Prius or the Chevrolet Volt have to use their petrol engines to get extra zip. Pure electric vehicles such as the Nissan Leaf depend on gearboxes to generate the extra torque for arduous tasks. By contrast, the Tesla Roadster uses just one gear-such is the flexibility of its three-phase induction motor.

So far, **Toyota** has remained mum about its neodymium-free electric motor-generator. The design used in the current version of the Toyota Prius (the car actually has two such units, one for propulsion and regenerative braking, and the other to run all the on-board accessories) combines both conductors and a permanent magnet in its rotor core. On light loads, the unit works more like a permanent-magnet motor. On heavier loads, the induction features predominate.

In moving to a pure induction design, Toyota could do worse than take a page out of the Tesla car company's manual. Weighing in at 52kg (115lb), the Tesla Roadster's tiny three-phase induction motor is no bigger than a watermelon. Yet it packs a hefty 288 horsepower punch. More impressively, the motor's 400 Newton-metres (295 lb-ft) of torque is available from rest to nearly 6,000 revolutions per minute. Having access to such a wide torque band eliminates the need for a second or third gear in the transmission. The result is a power unit that is light, compact and remarkably efficient.

Overall, the Tesla Roadster is said to achieve a battery-to-wheels efficiency of 88%-**three times better than a conventional car.** With Nikola Tesla's robust and reliable induction motor making such a successful comeback, it is puzzling to see why anyone should worry about potential shortages of neodymium and other rare-earths for alternative power and transport.

Review of the Fourth Conference on Future Energy

Press Release, Integrity Research Insitute, March 28, 2011

The Fourth Conference on Future Energy (COFE4) was held on March 15-17, at the University of Maryland, Riggs Alumni Center, in the Washington DC area. This year, we joined the [Institute for Advanced Studies in the Space, Propulsion & Energy Sciences \(IAS-SPES\)](#) and featured 70 speakers who presented peer reviewed papers which covered of a wide array of new-energy technologies, emerging renewables, advanced future energy concepts, fusion options, advanced propulsion concepts and bioelectromagnetics. This conference was educational, entertaining and useful to all attendees, which included government, military, academic delegates as well as energy scientists, entrepreneurs and inventors from all over the world.



IRI President, Dr Valone addressing the conference attendees.

The morning of the first day was opened with presentations from our Plenary Speakers. The first section named New Era in Space Research and Technology was moderated by NASA engineer Glen Robertson and featured ground breaking presentations by two speakers from the NASA headquarters: Jay Falker on "NASA innovative Advanced Concepts" and Harry Partridge on "NASA Game Changing Technology" and followed by a presentation by David Froning on "Example of Advanced Concept Technology in Australia". Then the second portion was moderated by Dr Thomas Valone, of IRI and included an amazing presentation on "Ion Conductive Material

from Terrestrial Energy Conversion and Storage for Space Utilization and Life Support" by Dr. Eric Wachsman, Director of UMERC and Crentz Centennial Chair in Energy Research at the University of Maryland and followed by MS-candidate Scott Kelsey from Missouri State University's breakthrough presentation on "Qualification and Quantification of Telomeric Elongation due to EM Resonance Exposure" which has enormous implications for advancement in aging mitigation and disease, since human DNA telomeres normally *shorten* with age. Scott works in association with the groundbreaking inventions of Norm Shealy, MD, PhD, neurosurgeon and inventor of the TENS Unit and author of *Life Beyond 100: Secrets of the Fountain of Youth*, (Jeremy Tarcher,

2005).

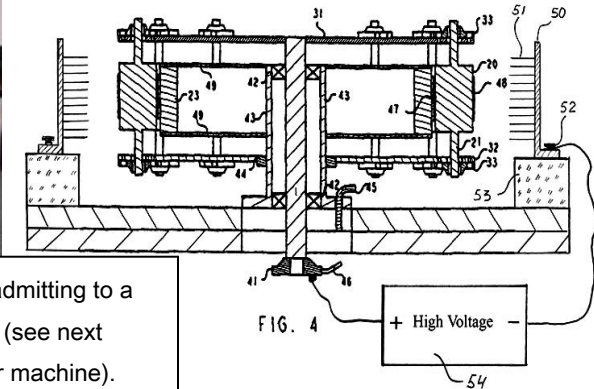
Tuesday afternoon followed with a forum chaired by James Woodward of California State University entitled Frontiers in Propulsion Science Experimental Results and included a presentation by Alexander Martins, Mario Pinheiro, on "*The Nature of Propulsive Force of Asymmetric Capacitors in the Atmosphere*", which was particularly interesting since it related directly to the T. Townsend Brown experiments in the IRI book, ***Electrogravitics Systems***, edited by T. Valone. The session also included an outstanding theoretical presentation by Dr Terence Barrett and David Froning entitled "*New Directions in Electromagnetism for Propulsion and Power*" which identified the benefits of toroidal coils for vacuum modification and two presentations on Mach effects by Dr Woodward and Nembo Buldrini. This was followed by a



Scott Kelsey of Missouri State University



Sergei Godin (left) listens to Paul Murad (glasses) admitting to a replication of some aspects of Godin's Searl device (see next article and diagram to right of the rotating homopolar machine).



forum entitled Advances in Contemporary Propulsion Sciences and Advanced Technologies, Concepts and Techniques for Space Application chaired by John Cole and Chuck Suchomel, USAF WPAFB Ohio, that included a presentation on "*Hydrogen Storage Methods for Microthrusters*" by Dr George Miley, from the University of Illinois in Champlain, an past IRI award recipient of the "Integrity in Research Award" and "*Vasimr Human Mission to Mars*" by Dr Chang Diaz and Andrew Illin. Ending the day was the much anticipated presentation of the entire conference by engineer and physicist, Paul Murad with coauthors, Morgan Boardman and John Brandenburg on: "*The Morningstar Box*", a replication of the mysterious John Searl and Russian magnetic energy converter (MEC) device of Godin and Roschin. It was an historic occasion since Mr. Sergei Godin came from Russia with his financial backer Mr. Kruglak just for the breakthrough announcement by Murad that the anomalous "magnetic walls" and the "temperature cooling zones" surrounding the MEC were independently confirmed and measured! Paul also showed two videos of the spinning device to highlight his findings that for the first time, validates the work by Godin and Roschin, who also hold a patent on the device. The room was filled to the max as the audience listened attentively to Paul Murad and a lively question and answered followed. It was a most fitting way to close the first day.

Wednesday morning opened with a forum chaired by Dr Valone and Len Danczyk of Energetics Technologies on Solar and Space Solar Power which included: "*Terrestrial Micro Renewable Energy Application of Solar Technology*" by Dr Narayanan Komerath, who showed amazing simple applications in third world countries of solar energy, including solar roof ovens and solar stoves in



India. He emphasized the fact that education of these new technologies to the public is essential and necessary for their success. This presentation was followed by Paul Jaffe's *"Sandwich Module Development of Space Solar Power"* with a novel way of producing solar energy. Concurrent to these forums ran the Frontiers in Propulsion Science, Theories, Models and Concepts forum that included presentations: *"Vortex Formations in the Wake of Dark Matter Propulsion"* by Robertson and Pinheiro and *"The Chameleon Hypothesis and Prospects for Novel Forms of Energy Generation"* by Don Reed, showcasing this novel Chameleon hypothesis

which wa also referred to by other speakers. Also presented was a lecture on *"Reverse Engineering of Podkletnov's Experiments"* by Ben Solomon who showed admitted anomalies by NASA regarding the spinning superconductor experiment, and also a talk on *"A Matter of Definition"* by Greg Volk, outlining key points on advanced Propulsion science and *"Progress in Antigravity Mechanism using Rotating Masses"* by Chris Provatidis from Greece, whose presentation including work by Dr Paul LaViolette, former IRI board member and author of the bestselling book: ***Secrets of Antigravity Propulsion*** (Bear & Co., 2008) The rest of the morning included a packed forum on Advanced Nuclear Energy with presentations by Liviu Popa Simil, Dr George Miley, Andrew Muelenberg, and many others. The afternoon continued with the forum: Space and Society: a Cultural History of Space Age 1900-2009 was chaired by Theodore Swanson of NASA Goddard Space Flight Center in Greenbelt Maryland and Bob Zimmerman. Presentations

included: *"Space Exploration: The Dream Of The First Half Century Vs. The Reality Of The Second Half"* by Bob Zimmerman, *"The Death of Rocket Science in the 21st Century"* by Glen Robertson and Daryl Webb, *"How we Remember Apollo"* by Dr Launius and *"Identifying Sociological Factors for the Success of Space Exploration"* by Charles Lundquist, all which gave valuable historical facts that we will need to build upon for future Space Program.



Journalist Jeane Manning and Moray King, presenter

Closing the afternoon was the forum Other Future Energy Sources, which highlighted several future energy sources such as *"A Hyper-Efficient Inverter driven by Positive EMF in Combination with a Transient Phenomenon"* by Osamu Ide of Japan, *"The Flow of Energy"* by Frank Znidarsic,

and prior COFE speaker in 1999 Dave Goodwin from the Department of Energy, who gave a informative presentation on resources both intellectual and financial at the DOE, as well as a groundbreaking presentation by Moray King *"Water Electrolyzers and Zero Point Energy"*. An interesting follow-up to Terence Barrett's presentation was the *"Electromagnetic Radiation Experiments with Transmitting Contra Wound Toroidal Coils"* by Dave Froning. This was followed by our German friend and colleague, Dr Thorsten Ludwig on the Hans Coler device, which included Dr Ludwig's current measurements and experiments. IRI has been selling the British Intelligence 1946 report on Hans Coler's device *"The Invention of Hans Coler"* (#504) for over 10 years and it is always in demand as an insight into an alternative energy device that even credits the *"Barkhausen Effect"* for its energy production. Dr Ludwig's paper was a great research project that also involved student construction of the full scale circuit.

After a full day of presentations, all attendees looked forward to our Evening Banquet event, which included the IRI annual awards ceremony. This year the recipient of the *"Integrity in Research Award"* went to David Froning, whose pioneering work on *"vacuum engineering"* with electromagnetism for propulsion and power using contra-wound toroidal coils has made

groundbreaking finds which have long range implications for space travel and gravity modification (his paper in the COFE3 Proceedings is a good summary of his life's work).

IRI wished to recognize the hard work that David Froning has done for years to bring scientific integrity to engineering of the vacuum, which is one of the most challenging projects any physicist can undertake. Following the award ceremony was our special banquet speaker and former COFE2



Dave Froning receiving IRI's "Integrity In Research Award"



Dr Bushnell from NASA giving his amazing presentation

speaker, Dr Dennis Bushnell, Chief Scientist at NASA Langley Research Center. His amazing talk entitled "The Frontiers of Energetics and Space Propulsion" was filled with validations of many theories and hypothesis that IRI has supported for the past 10 years, including acknowledgement of zero point energy utilization and LENR, with the latest Rossi Experiments. He further recognized that the basis for space

utilization and exploration is energetics and stated that we have reached the plateau of chemical propulsion and must move beyond them, looking at a large and growing number of options seriously to be studied and triaged to determine their performance abilities, possibilities, operability, costs and safety. All of them require investment and evaluation by his group at NASA to implement them at large.

The following and last day of our conference started with the forum Enabling Technologies for Surface Science, chaired by NASA Greenbelt director, Pamela Clark. It included presentations on Robotics, Cold Temperature Packages. The most amazing presentation without a paper was by P J Piper from QM Power, which is marketing the breakthrough work by Joe Flynn on "parallel path" magnetic motor designs that save energy by doubling the flux and creating four times the power delivery. Mr Piper stated that most motors on the market run at 20% or less where the Flynn motor design delivers over 90% efficiency! The companies that are onboard with www.QMPower.com include Toyota and many others. This motor and generator design is destined to replace all existing single path motors on the market today. Concurrently with the forum was the Unconventional Physical Principles and Gravitational Models, was chaired by Paul Murad and John Brandenburg of Orbitec. Talks included: "Progress on the GEM Theory", "Experiments in Synchronicity" by Shelley Thompson and "Replication of Pulsar Behaviors to Create Space Propulsion". The last forum of the conference was Transformational Technologies to Expedite Space Access and Development, was chaired by John Rather and James Powell of Maglev 2000 LLC. Presentations on "Maglev Launch systems and a Test Program for the Magnetically Inflated Cable for Large space Structure System" among others was presented.

We want to thank all our sponsors: **Global Gateway Foundation, Arcos Cielos Research Foundation, iRenew Corp and an anonymous donor** for their financial help and support and special thanks to our co-hosts from IAS-SPES, Glen Roberston and Melissa Lee who worked tirelessly to make this event a great success. Most of all, we want to deeply thank all our volunteers who helped in many ways, including transporting presenters, assisting attendees, the IRI booth service and many other tasks too numerous to mention. Special thanks to: Jim Newburn, Zoe and Carina Slepian, Elaine Chen, Hamilton Smith, Elizabeth Grace, THANK YOU!



COFE4 volunteers, Hamilton Smith, Zoe Slepian and Elizabeth Grace at IRI booth



Melissa Lee of SPESIF helping attendees.

Russian Temperature & Magnetic Anomaly Confirmed in Homopolar System

Ed. Note: The Energy Box is based on the Russian multi-rotor orbiting homopolar system US [6,822,361](#) awarded to Roschin and Godin. A drawing from one of their recent articles, based on the patent, is reproduced above. Sergei Godin is expected to be in attendance at the conference! If you come no other day, Tuesday March 15 is the day not to miss! DVD of talk is made available after conference. -- TV

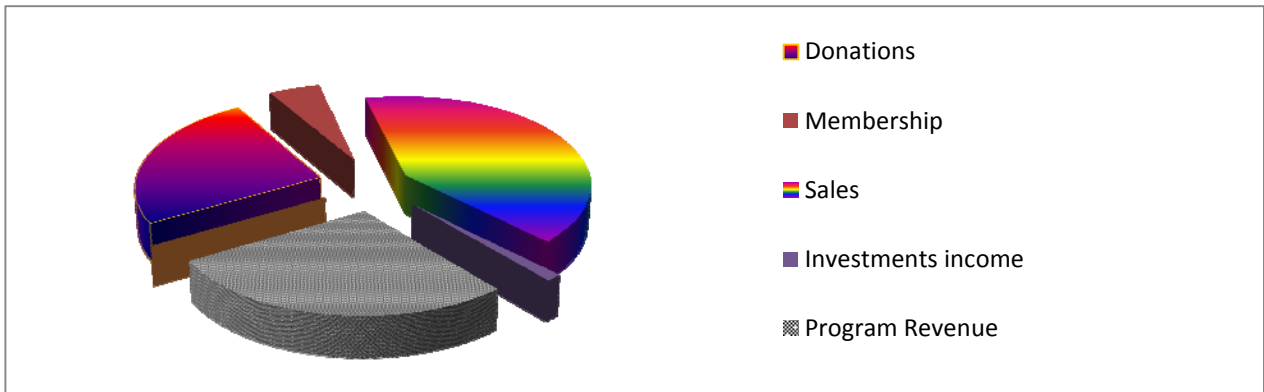
The Morningstar Energy Box (Tuesday, March 15, 4:30 PM) SPESIF-COFE4 Presentation. Paul A. Murad and Morgan J. Boardman, Morningstar Applied Physics Inc., LLC Vienna, VA 22182, 703- 759-2028; Ufoguypaul@yahoo.com John Brandenburg and Jonathan McCabe, Orbital Technologies Corp., Madison, WI 53717. Tel:608-827-5000; brandenburgj@orbitec.com

SPESIF-COFE 4 Abstract. The Morningstar Energy Box is a derivative of a Searl device modified in a similar fashion used by the Russian Scientists Godin and Roschin. These devices use laminated rollers and a main ring made of different materials used to enhance electrical and magnetic properties. Where the Searl device uses rollers to move around a main ring, the Russian device kinematically constrains these rollers within a mechanical cage. The operational theory for the Energy Box uses rotating electromagnetic fields to create gravitational effects and is different from those theories outlined by either Searl or the Russians. A prototype device is currently under test and unfortunately self-accelerated motion has yet to be obtained. The Russians have made several serious claims that their device produced self-acceleration to generate electricity, created a relatively large weight loss, generated discrete walls of magnetism far from the device and that a temperature drop exists when the device loses weight. To date, no one has validated these outrageous claims. However, we have found similar phenomenon regarding temperature loss and the discrete magnetic walls to occur during tests of the Energy Box and have correlated the temperature drop that the Godin & Roschin device produces as being a consequence of the Unruh effect. Where they claimed to lose as much as 35% of the weight of a 375 kg armature, the Energy Box only loses as much as 2% of its 490 pounds at this stage of the test cycle. Additional tests and modifications are underway to hopefully increase the weight loss.

Ed. Note: -For More information see Godin and Roschin [original paper](#) in the IRI website, describing their experiments.

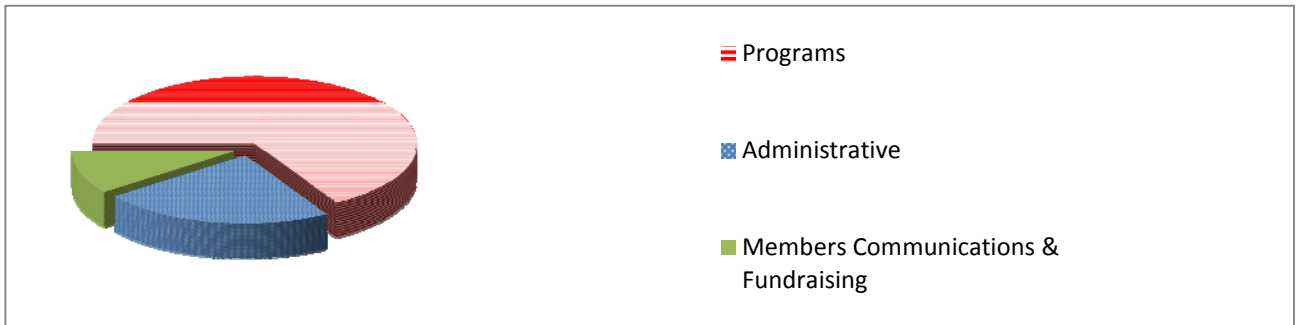
IRI FINANCIAL REPORT 2010

REVENUE



Donations:	\$ 16,000.00
Memberships:	\$ 1,102.00
Sales:	\$ 65,528.00
Investment Income:	\$ 84.00
Program Revenue	\$ 18,000.00

EXPENSES



Programs:	\$46,106.00
Administrative:	\$16,035.00
Members Communications And Fundraising:	\$ 7,104.00

BALANCE SHEET

Beginning of Year

End of Year

Cash, savings and investments	\$20,361	\$ 17,354
Other Assets	\$14,818	\$ 9,301
Total Assets	\$35,179	\$ 26,655
Total Liabilities	\$ 560	\$ 560
Net Assets or Fund Balances	\$34,619	\$ 63,369