



INTEGRITY RESEARCH INSTITUTE



ANNUAL REPORT 2018

CREDITS

**Integrity Research Institute wishes to acknowledge the following for this
IRI Annual Report 2018**

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Cover Notes: Front cover is a collage from the 2018 COFE10; Back cover is a page from the Proceedings of the International Conference on the Unity of Sciences with Tom Valone at his Poster Session (top) and Jacqueline Panting ND in her office (below)

IRI OFFICERS AND DIRECTORS - 2018

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PRESIDENT's LETTER

This past year was very important for IRI programs in the energy, propulsion, and bioenergetics areas. With the analysis by Stanford that **5° to 6°C is the most likely increase** in global temperature by 2100, IRI distributed a two-sided flyer on Capitol Hill to all of the Senate and House offices to educate the staffers, besides advocating **carbon sequestration** at my Gaia TV interview and preparing a 15-page climate article for the International Journal of Geosciences. We also pioneered a lasting collaboration for our conferences with Steve Elswick at TeslaTech, LLC with COFE10, as well as finalizing the *Proceedings of COFE* has been modified to become *Selected Papers from COFE 1-10* with forty (40) papers for our IRS-mandated public education service.

The **Spiral Magnetic Motor (SMM)** had a successful crowdfunding campaign www.tinyurl.com/Indiegogo-SMM in the early part of 2018. As noted in this Annual Report 2018, we are now signing a Research Agreement with the University of Maryland for a *magnetic switch* at the commutation point using piezoelectric and magnetostrictive materials.

IRI also is getting closer to licensing the intellectual property and the assigned rights to US patent #8,825,174 on **Antioxidant Therapeutic Electric Clothing** by Dr. Jacqueline Panting, the resident naturopathic doctor on our staff. We are planning meetings with sports companies for licensing. We also have been successful in marketing an OsteoPad for reversing osteoporosis, osteopenia, and cartilage loss. Our clients have benefitted from reduced healing time for bone knitting of fractures. Our clients have also been obtaining Bone Density Scan tests before and three months after using the OsteoPad each night and their doctors are stating “statistically significant improvements” in bone density www.OsteoPad.org. We might also be interested in licensing the EM Pulser or EM PulsePad products that have been developed based on another doctor's work (Dr. Glen Gordon) who reversed his congestive heart failure and bicycled across the US afterwards with his prototype model (EMPulse) which obtained FDA approval for a time. www.BioenergyDevice.org

I may have mentioned in the past newsletters the IRI propulsion projects that were just started two years ago with Mike Gamble (Control Moment Gyro for electrically powered unidirectional force as Boeing has been doing for years on their satellites) and with Robert DeBiase (Casimir Force Generator for unidirectional force on a microscopic scale). Both have been presenters at our Conference on Future Energy in the past, so we have DVDs and papers and/or slideshows from them as well, with updates in this Annual Report. Both projects are also progressing and have continuing presentations at our COFE events www.futureenergy.org.

Lastly, this **IRI Annual Report 2018** is the most valuable and practical energy innovation ideas that can be packed into one report. It is online <http://www.integrityresearchinstitute.org/links.html> with previous IRI Annual Reports in **PDF**, in order to use any of the hot links which give you a glimpse of the source reference articles and websites that we referenced. This Report contains lots of investor-ready energy inventions. For more, see future energy in person...attend COFE11 in August 9-10, 2019.

Thomas Valone, PhD, PE
President

HIGHLIGHTS 2018



We are very proud of IRI's accomplishments for the past year. For starters, we have totally revamped our Electronic Catalog with the award-winning software by Shopify. Our electronic catalog is now extremely easy to use and filled with videos and photographs of all our books, DVDs and bioenergy devices. A great addition are our "E-books" available for immediate download by a single keystroke! This is a dream come true for us, as we tried for years to make our books

available via download, especially for our supporters who are overseas since postage costs are quite expensive. The look and feel of this new electronic catalog is just amazing and we are so happy to offer our supporters the first class treatment they deserve when ordering our items online. Next for the upcoming months, we will be revamping our complete website, including the homepage and program pages. We are most excited about this and expect to have it all completed by 2020.



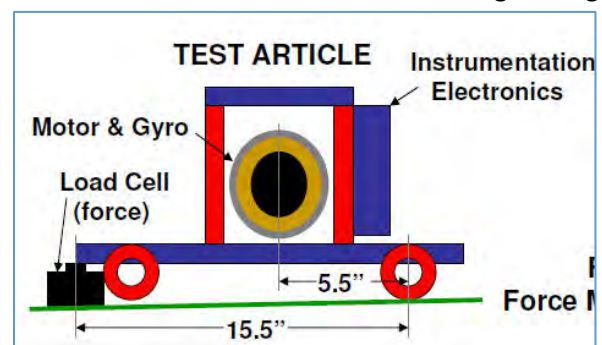
Conferences and Appearances. We held our 10th Conference on Future Energy on August 10-11, at the Crown Plaza Suites in Albuquerque NM. It featured 14 speakers including: Josh Reynolds, Dr Glen Rein, Gwen Holdmann, Mike Gamble, among many others who presented on a wide array of new-energy technologies, emerging renewables, advanced future energy concepts, advanced propulsion concepts and the

latest on bioelectromagnetics. This conference was included government, military, academic delegates as well as energy scientists, entrepreneurs and inventors from all over the world. In February, Dr Valone was invited to present at the ICUS XXIV conference In South Korea, he lectured on Future Energy Trends. Dr Valone was interviewed on the Radio Show "Coast to Coast" in June and reached an audience of over 1 million worldwide. Also on the "Richard Hoagland Radio Show" and "Midnight In the Desert" He also presented two different lectures on Mindfulness and Meditation at the United States Patent and Trademark Office and at the Natural Living Expo sponsored by Pathways. Lastly in November he flew to Colorado to be interviewed and taped by the GAIA TV network as part of the show: "**Beyond Belief**" with **George Noory**. He discussed several topics, such as Climate change, Tesla technologies, Meditation and Living without Food. The show is available as a live-stream on the GAIA.com website, with a short 5-minute preview can be seen at <https://tinyurl.com/ValoneGaia>.



COFE10 Conference. Clockwise from top left, Dr Glen Rein, followed by Dr Panting at booth, Judy Kosovich, Gwen Holdman and Mike Gamble.

Propulsion Program: The Control Moment Gyro (CMG) Project continued with more refinement and lightening of the apparatus while measurements were compared with previous reports. Dr Valone is the principal director and Mike Gamble the Engineer. For years, Inertial Propulsion has been advocated by IRI and now we have replicated a table-top model. The purpose of this experiment is to show that thrust is possible by scissoring gyros. Initial funding has been provided by our Institute and as we move forward will be seeking more. Eng. Mike Gamble presented at COFE10 his latest improvements, as well as results and data.

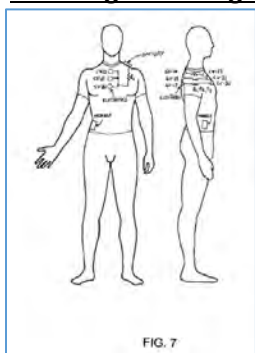




Also, under the same program, the crowdfunding through Indiegogo was instrumental in 2018 toward advancing our Spiral Magnetic Motor (SMM) Project. We are happy to report that we met our goal, thanks to the generous donations of many members and new generous supporters. The campaign ended in 2018 and collected over \$15,000. Our next phase doing a partnership with the University of Maryland Prof. Alison Flatau who visited us at our lab together with her post doctorate, JJ Park. A Proposal for a Cooperative Research And Development

Agreement (CRADA) will be forthcoming and we foresee starting the project in a few months. We humans always use gasoline, coal, or natural gas to power any motor. Instead, imagine our Magnetic Microturbine onboard to charge an electric vehicle, with no external connection. Yes, a magnetic gradient has been implemented into a permanent magnet motoring cycle. Now we add a proper choice of a magnetic actuator, commutator, or switch. This Spiral Magnetic Motor is designed to provide mechanical drive for electrical power generation. In 2018, it was also submitted to the "Create the Future Contest" and the online summary also includes a video: <https://tinyurl.com/CreateFutureValone>. Further reference information: <https://tinyurl.com/SMMslides> or <https://tinyurl.com/SMMpaper>

Bioenergetics Program.



We are also making improvements with this program that includes research on equipment, therapy machines and providers of electrotherapy. The Microcurrent Electrotherapy Antioxidant Clothes project is moving forward since we have the US Patent #8,825,174 by the US Patent and Trademark Office. We were partnering with Dr. Warren Jasper of the University of North Carolina Textile Engineering School working to develop several prototypes. IRI is presently experimenting on different textiles and prototypes that can be worn and tested. It will be desirable for the electrode clothing to withstand use and washing. Our line of PREMIER electrotherapy devices as well as EM Pulser, EM PulsePad, OsteoPad and Maximat continue to be improved and sold. We plan for 2019 to develop a commercial version of our Energy Chair prototype, which has many therapeutic benefits and much public appeal.

Electrogravitics Program: The scientific validation of a science that connects gravity to electricity continues to be researched by us. Starting with our 1994 publication of *Electrogravitics Systems: Reports on a New Propulsion Methodology*, fourteen years later, a follow-up second volume called *Electrogravitics II: Validating Reports on a New Propulsion Methodology* has been updated and released which contains journal articles by the Army Research Lab and Honda Corporation on their experiments and theory of how electrogravitics and electrokinetics can work, besides patents by NASA and others. Our discovery that the classical "electrokinetic field" equation can predict how and why pulsed

electrogravitics will work best was a great breakthrough. We

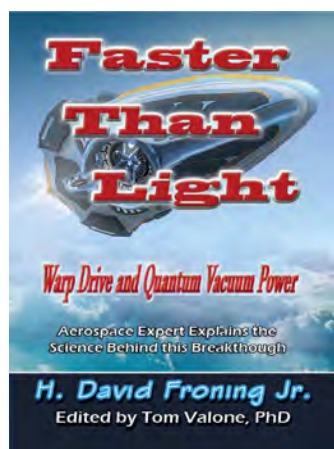


continue to research the electrogravitics properties of the "Art's Parts", generously made available to study by the journalist Linda Moulton Howe. We have taken measurements and are trying different methods (photo above right) for achieving the predicted, theoretical antigravity-electrogravitic



effect with directed RF signal beamed energy to the multilayer artifact (above photo left) of bismuth, magnesium, iridium, and zinc. It is possible that this research will result in a third and final Volume III to make the Electrogravitics books a trilogy.

Zero Point Energy Program. The research continues on the possibility of tapping zero point energy through a project with Robert DeBiase and in partnership with Veden Akademie named: ***“Quantum Fire Project”*** which has continued for the past three years. Because the Casimir forces are ultimately the result of quantum effects, the virtual particles that come from zero point energy fluctuations are the source of the Casimir Effect. If asymmetric forces are observed, it will unleash the most disruptive technology ever seen since humans first harnessed fire. The Casimir equations are very convincing and Dr. Thorsten Ludwig from the Veden Akademie in Germany has been collaborating on the project and is optimistic about obtaining positive results with his Atomic Force Electron Microscope (AFM) testing of the prototypes that both scientists are designing. IRI received some funding this year and preliminary data and tests with suitable polymers and diffraction gratings have been produced. We are also developing connections with a few scientists, such as Dr. Garret Moddel, who are designing ways to harvest energy with zero biased diodes. Much research is still being done.



IRI Publications and Books. We are happy to report that the new book submitted to IRI was edited throughout 2018. Retired Aerospace Engineer and past COFE Award Speaker, H. David Froning has donated the copyrights to IRI of his book, which shall be entitled: ***“Faster Than Light: Warp Drive and Quantum Vacuum Power”*** The book is still being edited by Dr. Valone and when finished will be published by Adventures Unlimited Press. It has expanded to more than 440 pages in the past year and is full of aerospace anecdotes, theoretical aerospace designs, and experimental results. The book will certainly turn out to be a great resource with the first proof that the speed of sound and the speed of light have almost the same equations and graphical results of speed vs. drag. Out in space, the drag and propulsion is provided by the quantum vacuum. Along with many personal memories of the author and invaluable insights into the aerospace world history. The “Future Energy

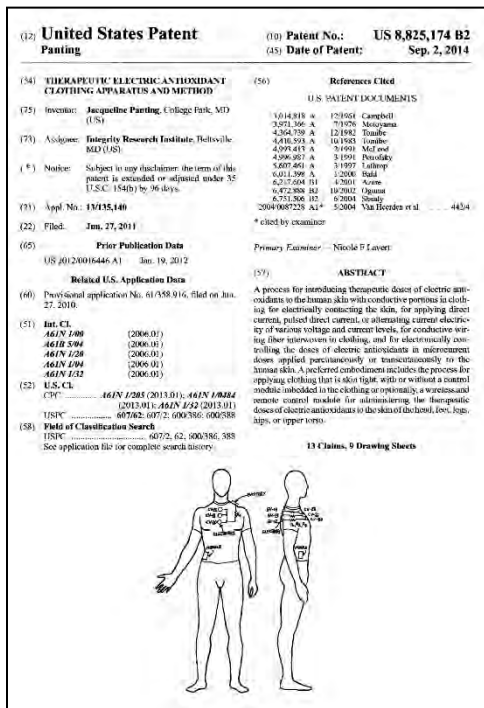
Annual 2017” was published and mailed free to our membership in 2018, which like this annual, includes our latest summaries of Energy projects, including Electrogravitics, Energy generation, Bioelectromagnetics.

Future Energy News Program: FUTURE ENERGY eNEWS. Research on 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. This electronic newsletter showcases all the latest emerging eco-friendly technologies that are being developed worldwide and published in Journals, Magazines and Newspapers. In 2018, we continued to publish the Quarterly “Future Energy” magazine and mailed it to all members for free. The magazine contains all the latest papers and articles relating to emerging energy technologies. Also, we regularly upgrade our IRI website including more information on emerging energy technologies, climate change, and video uploads and press releases. The main emphasis in 2018 was to integrate a **Shopify.com web service** into the IRI website for order fulfillment that is user friendly and includes shipping costs calculation. Sign up on our homepage, www.IntegrityResearchInstitute.org if you have not already. It goes out monthly.

Bioenergy Device Electrotherapy Program



Dr. Jacqueline Panting ND was granted U.S. Patent #8,825,174 on September 2, 2014 and assigned to IRI. We were previously working with Dr. Warren Jasper from NC State College of Textiles to produce a working prototype that is durable and washable, using the latest conductive fibers stainless steel electrodes. Soon sports competitors and Olympians will be wearing our product since it will quench the free radicals developed by “exhaustive exertion” and allow the performer to fight fatigue much more easily since “Electrons are antioxidants” as discovered by Dr. Valone and Dr. Oschman.¹

In keeping with the Bioenergetics Program that includes the **EM Pulser**, **OsteoPad**, and the latest **EM PulsePad** products, the development of **Therapeutic Electric Antioxidant Clothing** will be licensed soon, with one of three sports apparel companies who have shown serious interest in the rights to our invention, mainly for athletes who compete professionally. Speaking of the EM Pulser, PulsePad, and OsteoPad, all



inspired by former IRI Advisory Board Member, Glen Gordon, MD, we have maintained the original essential design ingredient, being the nanosecond rise time of the pulsed magnetic field (PEMF), which attracts a heat shock protein (HSP70) to start healing inflammatory illnesses at the site where it is applied. Numerous testimonials now appear on our active webpage, www.BioenergyDevice.org which attest to Dr. Gordon's genius, such as a recent one from Ted S. who states,

“My wife and I have been able to go on vacations. I can drive. I can think clearer. People are not feeling sorry for me anymore. This is all because of your product. Thank you.

His further lack of scarring or inflammation from facial surgery (see photo) was attributed to the immediate use of two IRI products, EM Pulser and the Premier Jr.

A one hour video lecture of Dr. Gordon, providing complete instructions on their use, is provided with each EM Pulser and PulsePad product. The OsteoPad has been an outgrowth of the same circuit design but applied with pancake coils distributed over a 14"x20" pad or a 20"x 60" pad (MaxiMat). The **Premier** line of products, designed around high voltage electrotherapy that boosts the cellular TMP and antioxidants, has also been selling well. Other patent filings are also in the works, on behalf of Integrity Research Institute, for forthcoming health restoration products, such as the ATP Turbo, a 670 nm with 850 nm near-infrared LED handheld product, that is being designed to provide a stimulating frequency combination shown to activate ATP energy production.

¹ Oschman, James. *Energy Medicine: The Scientific Basis*, Churchill Livingstone, 2000

Spiral Magnetic Motor – Primary IRI Research Project Designed for a Clean Energy Future with Magnets and Creativity

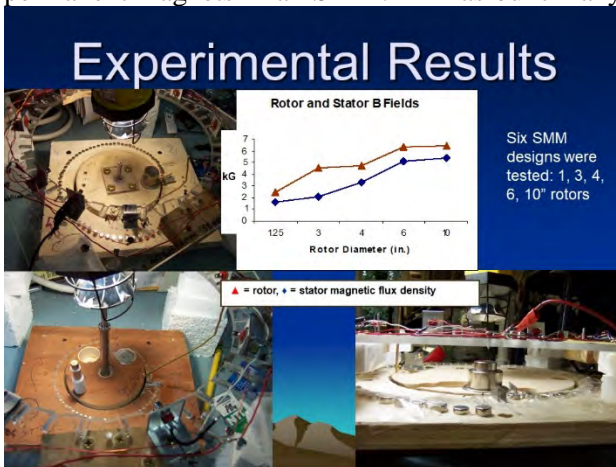
Some physicists remind us on science documentaries that electrons in the mountains have been spinning for millions of years. Yet, the key to unlocking zero-point energy and the negative energy of the quantum vacuum is the spinning electrons which create magnetic fields and also the overlooked “**Magnetic Gradient.**” Now the University of Maryland, Aerospace Department has shown interest in collaborating on the magnetic switch for this Spiral Magnetic V-Track Motor.

While we use the voltage gradients, thermal gradients, and even gravity gradients all of the time to perform useful work, our world has not mastered the magnetic gradient (a change in magnetic field intensity over a distance of space). The Spiral Magnetic Motor (SMM) is just the kind of magnetic gradient motor which is ripe for scientific research today because the practice of energy harvesting is gaining a wide range of possible options. Capitalizing on an ambient source of energy, such as a passing magnet causing a voltage spike with Wiegand wires, will lead to a viable method of magnetic switching for the SMM rotor so that the cycle can be repeated. This is very exciting for the serious inventor since IRI has shown that 90% of the cycle is already powered by permanent magnets in an SMM. IRI has built many SMM models and published the results in peer-reviewed

journals.²The next phase of research will be to contract with a custom magnet designer for the commutation, with an energy harvester. Peer-reviewed paper and crowdfund video online:

www.tinyurl.com/IndiegogoSMM

or <https://tinyurl.com/SMMpaper>. IRI has funded materials for the Spiral Magnetic Motor Research Project, up until now with the volunteer labor of engineer, Thomas Valone, whose SMM paper has already received popular achievement award notification on ResearchGate, from research done with multiple test models of the axial design pictured on the next page. The exciting part is that



we now have all of the statistics necessary to predict angular momentum, torque, power, and energy production. This helps tremendously for considering energy harvesting for any electronic motion sensor, speedometer, piezoelectric switching controls, etc. In 2018, it was also submitted to the “Create the Future Contest” and the online summary also includes a video: <https://tinyurl.com/CreateFutureValone>.

The development objectives for this spiral magnetic motor (SMM) and generator project, with Phase I completion in 2018, fall into two basic categories but others may be discovered as the project proceeds:

1. The first is a self-sustaining, spiral permanent magnet generator for electrical power, replacing fossil fuel-based generation, for a **Magnetic Microturbine** that can be (a) stationary for single user, community-based distributed use or (b) portable for electricity generation inside land, sea, or air electric vehicles (EVs).

2. The second is a **Magnetic Motor** of similar design as above but optimized with weight to power ratio for production of torque in automobile and airplane engines supplying basic transportation with a revolutionary no-fuel motor.

Both applications utilize an increasing magnetic field strength (gradient) surprisingly present in 90% of the spiral magnetic cycle. The Magnetic Microturbine will free all the countries of the world from dependence on coal and natural gas, while the Magnetic Motor will supplant oil usage for vehicles, thus raising the standard of living for everyone with long-lasting, clean energy.

² E.g., “Permanent Magnet Spiral Motor for Magnetic Gradient Energy Utilization: Axial Magnetic Field” Presented to the Space, Propulsion & Energy Sciences International Forum (SPESIF), February 23-26, 2010, Applied Physics Laboratory – Johns Hopkins University, sponsored by the American Institute of Physics



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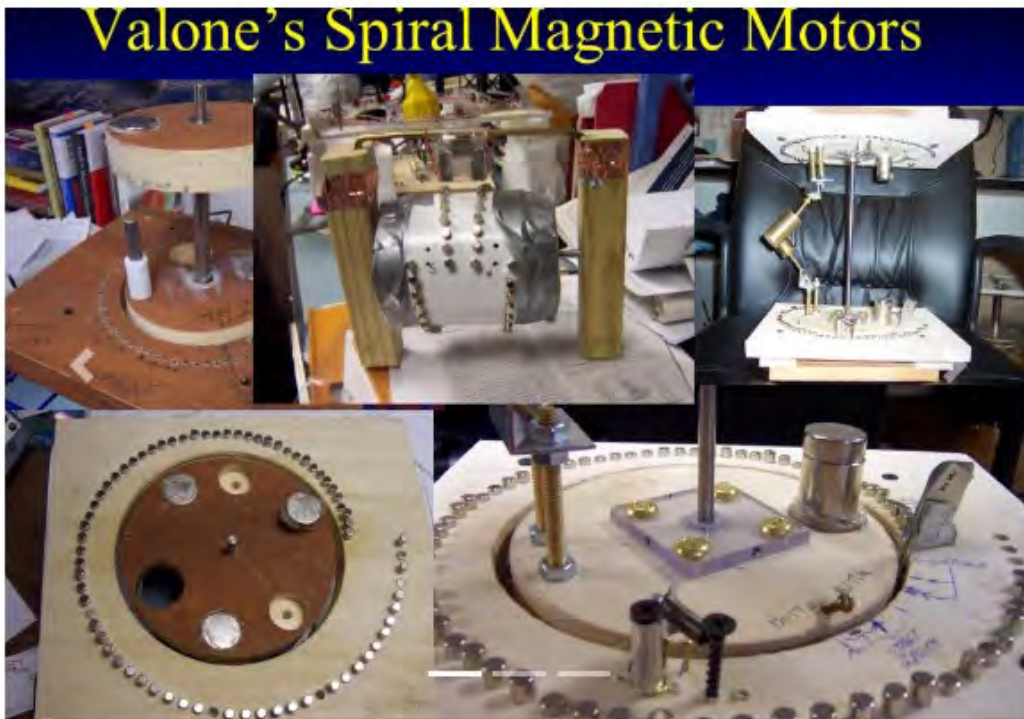
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Permanent Spiral Magnet Motor

Thomas Valone
United States

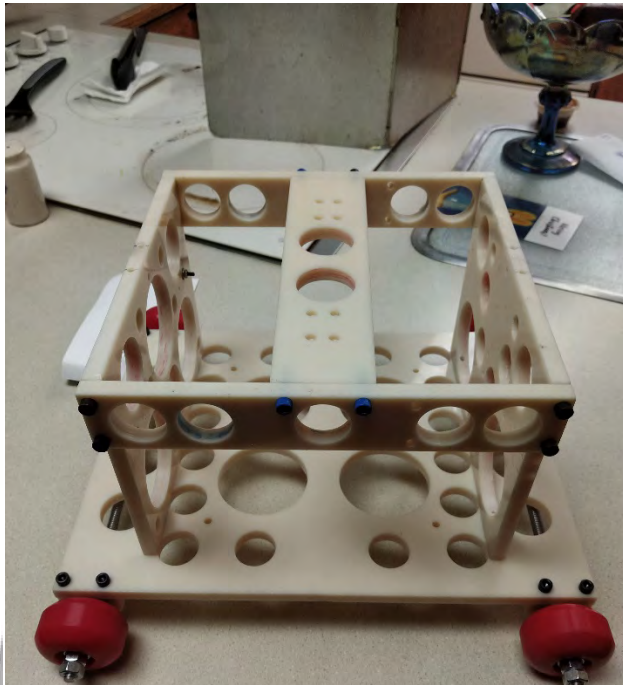
Votes: 0
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Sustainable Technologies
Jul 2, 2018

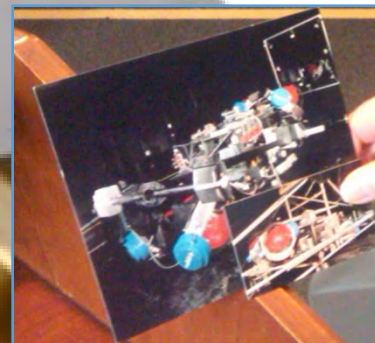


<https://contest.techbriefs.com/2018/entries/sustainable-technologies/9133-0702-044236-permanent-spiral-magnet-motor>

Control Moment Gyroscope – Secondary IRI Project Designed to Duplicate Boeing CMG for Commercial Transportation with Inertial Propulsion



Project Engineer Mike Gamble shows the Boeing CMG (below) that he worked on for their satellite maneuvering to keep them in orbit. IRI contracted with him to reproduce the basic design with only two gyros in a tabletop version. At COFE9, Mike reported that his calculated prediction and measured load cell forces (below) match each other within 10% accuracy, producing about 0.4 lb. of peak force. Reducing noise and weight has been the next development stage with the goal of movement driven solely by electrical power and thus controllable directionality. In that respect, the NEW design (left) uses plastic for light weight sturdy frame.

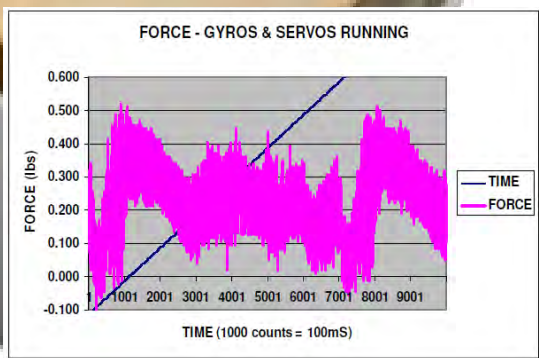
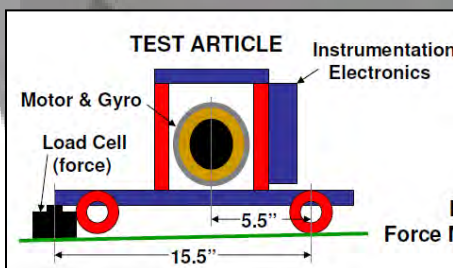


FORCE(max) EQUATION

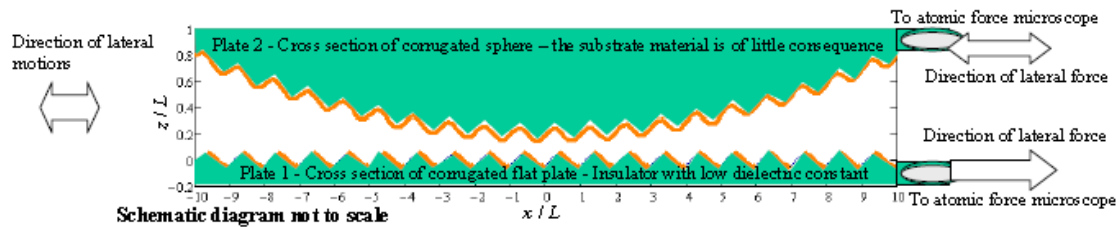
$$\text{Force (pk)} = \frac{1.77e-8 \pi^2 F_s F_r M_r (IDr^2 + OD r^2) D}{4 K^2 + D^2} \text{ [lbs]} = 0.4004 \text{ lbs}$$

F_s = Freq of Servo [Hz] (0.877)
 F_r = Freq of Rotor [Hz] (266.67)
 M_r = Mass of Rotor [g] (112)
 IDr = Inner Dia of Rotor [mm] (41.3)
 ODr = Outer Dia of Rotor [mm] (53.0)
 D = Gyros Separation [in] (4.50)
 K = Radius of Gyration [in] (7.28)

FC22 Compression Load Cell



Quantum Fire Project – Third IRI Project for Testing an Asymmetric Design to Rectify the Microscopic Casimir Force



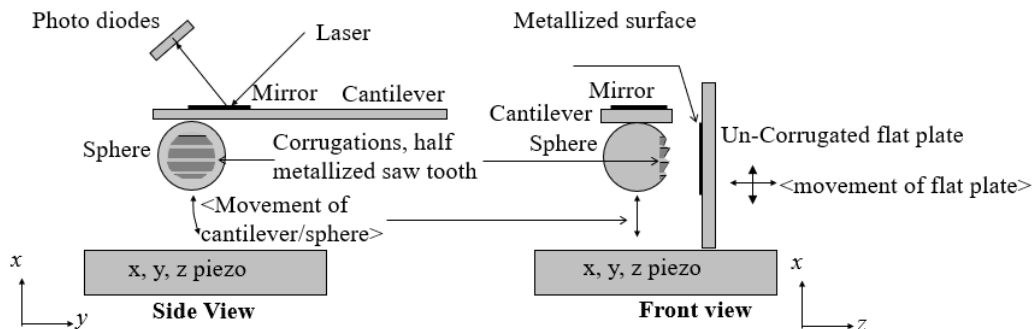
The **Quantum Fire Project**, under the direction the Project Engineer Robert DeBiase and Physicist Thorsten Ludwig, PhD, seeks to experimentally test certain force predictions of the proximity force approximation and a theoretical calculation for a perfectly conducting wedge, using an atomic force microscope that has been suitably modified. Preparations for the experiments include carefully manufacturing clean, smooth saw toothed shaped corrugated surfaces on a non-conducting sphere, which then has one slope of the saw tooth coated with metal. This metallically coated diffraction grading, when brought close to a metallically coated un-corrugated flat plate will create wedge shaped cavities (see diagram above). The experiment will then measure the nano-newton lateral **Casimir forces** on the sphere, in the vicinity of the adjacent surface of a diffraction grating with favorable microscopic grooves. The project aims to clarify the practical use of quantum fluctuations and zero-point energy with a 2018 update to use a FULL metallized version.

IRI has directed the team to make use of the nonsymmetric saw-tooth impressions in diffraction gratings to simplify the design. The material needs to be soft enough that impressions can be made by bringing a polymer coated metal ball against a diffraction grating while the ball is attach to an AFM cantilever. Such a process is necessary in order for the grooves to be properly aligned for taking AFM measurements. But it needs to be hard enough that metal can be coated onto one slope of the saw-tooth without damaging the sawtooth groove, thus creating the asymmetric propulsive Casimir force on each wedge which are expected to add up to a significant and measurable summation. Calculations have been made for the theoretical lateral forces to be expected for the arrangement using the perfectly conducting wedge theory. If lateral forces are proven to be present, fulfilling theoretical predictions, a prototype development of a **force production engine** can proceed and commercial applications will be explored.

Perfectly Conducting Wedge

Conceptual setup of atomic force microscope to detect anomalous lateral forces

Detecting lateral forces with Chen, Mohideen setup



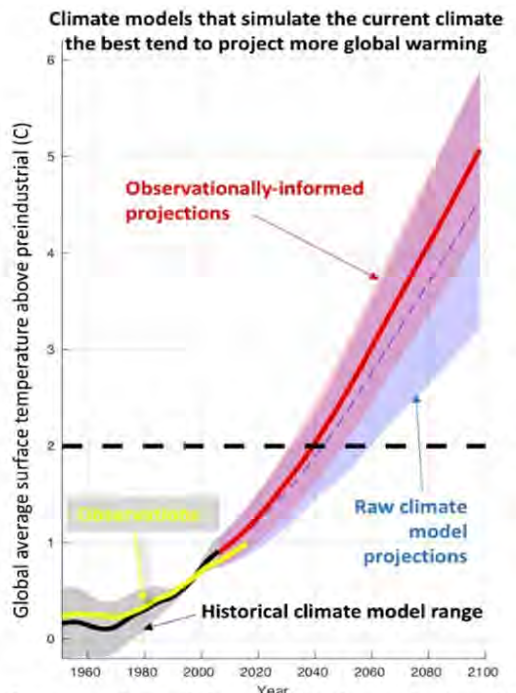
On the next two pages are a summary **IRI Climate Newsletter** that was distributed by the Capitol Hill Mail Service to every office of the US House of Representatives and to the US Senate at the end of the year. It is a summary of a full-length journal article that is being finalized for the *International Journal of Geosciences*.

Climate Change Overview Briefing Newsletter

Thomas F. Valone, PhD, PE Integrity Research Institute (IRI) Integrity-Research.org January 2, 2019

Preprint of article submission to the *International Journal of Geosciences*, for pub. in 2019

CONDENSED INFORMATIVE NEWS SUMMARY OF CLIMATE EXPERTS AND THEIR FINDINGS



Comparison of raw and observationally-informed climate model projections from Brown and Caldeira (2017, *Nature*)

With three (3) recent climate reports¹ indicating two degrees (2°C) Celsius as an achievable global limit to warming, there is now a serious discrepancy between these reports intended for the general public and the actual science underlying climate change. Leading climatologists have published details of the more likely five to six-degree (5-6°C) increase based on present trends and the climate models. Dr. James Hansen (Columbia U) discovered a triad of temperature, CO₂, and sea level to be interlocked and tightly correlated to each other.² This IRI future-oriented news brief offers a condensed summary of such climate information which has already proven to be accurate and more factual than the three climate reports cited above. We look at what the best climatologists expect to happen worldwide by 2100 **realistically**.

Figure 1 – Brown and Caldeira³ (Stanford) published a composite temperature trend graph which “reduces uncertainty” (says *Nature’s* Editor) and predicts at least a five degree (5°C) increase by 2100 (red line), not two degrees. Much is known about the present exponential trend in temperature up to 2020 but here the climate models are merged to include “observationally-informed projections” up to 2100.

This is a rude awakening. The extreme conditions which we know are inherent in such a five to six degree (5-6°C) increase have been well documented over ten (10) years ago. A National Geographic

90-minute online video, **“Six Degrees Could Change the World”** https://www.youtube.com/watch?v=R_pb1G2wloA is one of the best. It may be more important than ever for seeing, rather than just reading reports about, immanent inconvenient truth of each degree of change. Figure 1 equals a one-degree (1°C) Celsius increase EVERY twenty (20) years from now on, *even past 2100*. At five to six-degree (5-6°C) level above the 1900 baseline of 15°C world average temperature, heat stroke, famine, migrant invasions, farming/food production crises, widespread drought, uninhabitable equatorial regions, super tornadoes/hurricanes, and global tropical disease are anticipated to result.

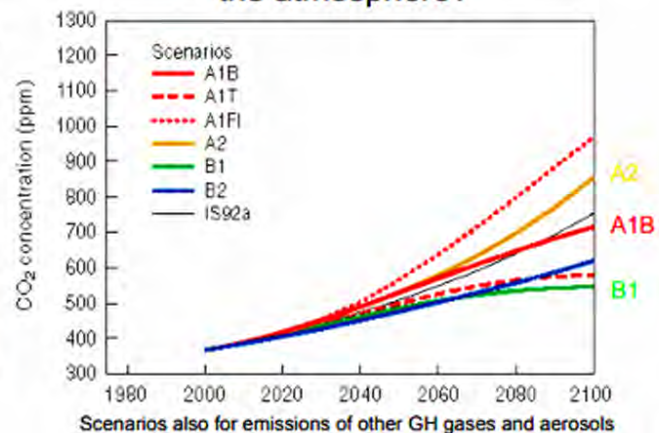
Q. “Isn’t CO₂ going to level out or ‘peak’ soon?”

A. The 9th UN Emissions Gap Report just released¹ states there is **“no sign of peaking”** and emphatically issues a **warning that carbon emissions are actually increasing** once again this past year, after a short dip, with a record **53 gigatons of CO₂ in one year**. All three (3) recent climate reports acknowledge the Paris limits are **not happening**. No major country seems willing to reverse its long-standing use of fossil fuels with a carbon tax.

Figure 2 - University of Washington composite CO₂ computer models extrapolating to 2100 (**A2** is the model projection for **business as usual** which **doubles** to reach 800 ppm by 2100).⁵

Note: All links are live in the online version at Integrity-Research.org

How much Carbon Dioxide will go into the atmosphere?

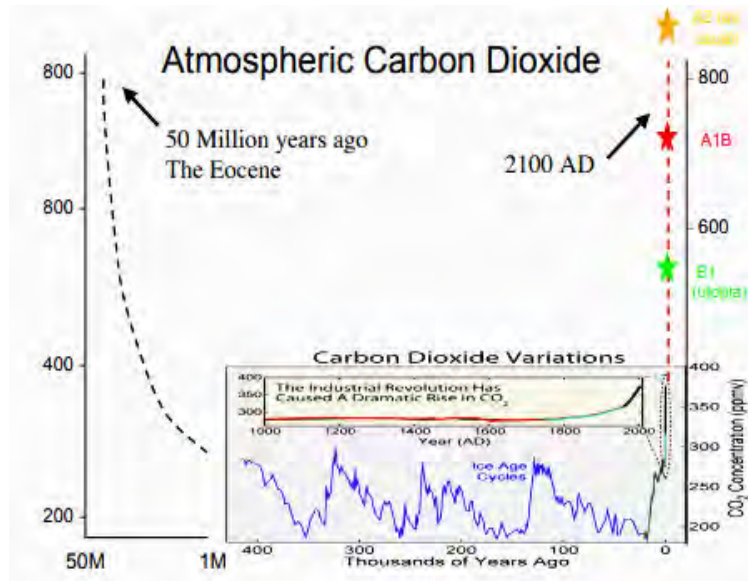


¹ [UNEP Emissions Gap Report 11/27/18](#), [NCA4 11/23/18](#), [IPCC Report 10/8/18](#), and [COP24 KATOWICE 12/2/18](#)

² Hansen, James et al., **“Young people’s burden: requirement of negative CO₂ emissions”** *Earth Sys. Dyn.* 8,2017

³ *Nature* V. 552, p.45–50 (12/7/17) **“Greater future global warming inferred from Earth’s recent energy budget”**

Climatologists agree earth–atmosphere–ocean system temperature is led by the **real climate driver of global CO₂**. Heat-



trapping CO₂ levels are seen in Fig. 2 to be rising at a similar exponential rate as temperature. However, we take note that the present 408 ppm of CO₂ is a level the earth has not experienced in over 400,000 years (see Fig. 3 and 4). Worse than that, humans are now pumping up the **CO₂ level** worldwide **by about 100 ppm EVERY 20 YEARS from now on**. If we allow business as usual (**A2 line**), the earth surpasses 800 ppm around 2100 and even 1000 ppm of CO₂ soon after, with worldwide **COGNITIVE IMPAIRMENT** to be expected, as shown in NIH office and classroom studies.³

Figure 3 – Washington Univ. (WU) compares 800 ppm CO₂ (right) with the most recent historical epoch with similar CO₂ levels (left).⁴

WU notes quoted from this slide: **“Eocene Period 50 million years ago - palm trees flourished in Wyoming and Antarctica was a pine forest - crocodiles lived in the Arctic - deep ocean temperature was 55°F (today it is ~35°F) - sea level was at least 300 feet higher than today and the difference in global temperature from our baseline of 15°C is an additional 15°C yielding a new average of around 30°C (86°F).”** Note: this is **ten degrees (10°C) higher** than the 5°C increase predicted from Brown and Caldeira (Figure 1) and Hansen (Figure 4).

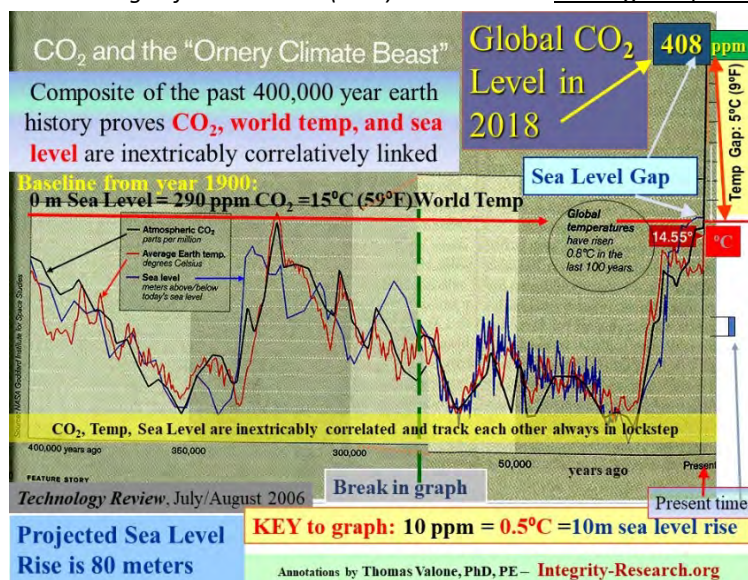


Figure 4 – Dr. Jim Hansen’s “Climate Beast Graph”⁵ annotated by IRI.⁶ Hansen, “alarmist and also right” (Daily Beast, 7/20/15), plotted the temperature, CO₂, and sea level for the past 400,000 years so the max and min points are coincident exposing a “Triad Correlation.”

This Hansen graph was converted by IRI into a useful and predictive **KEY**: 400 ppm is 11 times 10 ppm above 290 so 11 x 0.5°C = **5.5°C increase**. Beyond that, Eocene data appear to indicate **800 ppm of CO₂** will force temperature at least **15°C above baseline** (not five) during the 2100’s and beyond, which will be intolerable for the civilized world, with WU reported sea levels confirming Hansen projection.

CONCLUSION: This is a major cause for alarm since Hansen’s discovery of the *Triad Correlation* means the 21st century **5°C increase in global temperature is actually being thermally forced ONLY from the PRESENT global level of CO₂ passing 400 ppm**, even if global CO₂ emissions were to stop tomorrow. Therefore, the most recent journal articles are calling for **“Climate Adaptation”** while the UN Emissions Gap Report emphasizes: “Accelerating innovation is a key component of any attempt to bridge the emissions gap, but it will not happen by itself.” **IRI advocates** international cooperative billion-ton carbon capture programs, immediate carbon-free energy legislation to supplant fossil fuels, and emergency non-toxic aerosols dimming solar influx for mid-century intervention.

³ Environ. Health Perspectives; DOI:10.1289/ehp.1510037 <https://ehp.niehs.nih.gov/15-10037/> (open access)

⁴ https://www.atmos.washington.edu/academics/classes/2011Q1/101/Climate_Change_2011_part2.pdf

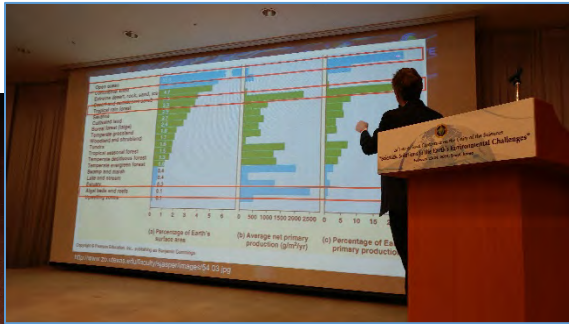
⁵ Hansen, James, *Technology Review*, July/August, 2006 <https://www.integrityresearchinstitute.org/climatechart.pdf>

⁶ <https://www.integrityresearchinstitute.org/CO2andClimateBeastgraph.jpg> (Ref. 6 reveals 400,000 years of Triad)

24th International Conference on the Unity of Sciences – ICUS XXIV

Main Theme: **Scientific Responses to the Earth's Environmental Crisis**

Held February 23-24, 2018 in Seoul, Korea. Sponsored by HJIFUS, Washington DC



Excerpt from the Panel Discussion at ICUS 2018 in Korea with Dr. Tom Valone

Dr. Mario Molina (UC San Diego): First of all thanks a lot for your presentations. I really enjoyed them a lot and some were very original thoughts. If I may I want to put a little reality into some of these thoughts in the following sense. We have the Copenhagen Accord with more than one hundred fifty heads of state agreeing that there should be no more than two degrees change. And nothing happened, why? Because the negotiators didn't agree. They thought it was still too expensive. So finally, we made it with the Paris agreement! Why? Because the technology improved and it turns out now that solar and wind are competitive. So you can do it without the sacrifice. So you don't have to ask sacrifices from society except to some extent because any change is difficult. People have already invested, so it's going to take time. So what I am talking about is, in spite of the reality and the fascinating ideas that we know about, that we hear, what will happen if we don't do anything? It's very hard to talk to politicians. Just one more thought. I worked closely with President Obama sort of designing the Paris Agreement because it was the United States that had to sign it so that Congress would not have anything to say about the Agreement. That's why you could not put a price on

emissions. Because the Congress in the United States is Republican and they are deniers of climate change. So in reality you cannot have a very sort of sensible global agreement if you have one of the major economies on the planet not agreeing with it. So one message of this is that we in the scientific community have done a very poor job of communicating the seriousness of these issues to the public and we see that very clearly in these results. So I think we need to strategize better. We need to work together, not just what are the marvelous solutions, it was fascinating what we can do with the oceans, but how much would that cost? Who would pay for that? It's fascinating! But why don't we also work on strategies? How the hell do we communicate these to society so that we get sort of approved by society in general and hence that would be easier to convince the leaders of the world to change. So I just wanted to put that

on the table because we need to really think about these strategies to really make a change. Otherwise we will keep meeting among ourselves just with very good ideas but maybe they will not necessarily be implemented.

Dr. Tom Valone (Integrity Research Institute): I think that Brian and I both have an answer to that question. And that is movies. We are both actually interacting with the media, California media film producers and our hope and dream when we talked about it is that each of us is trying to get documentaries done that will be compelling enough to supply the public with all of the information that they need to take action, to accept



the change and to look toward a rosy future. In other words, the movie needs to show the utopia we are talking about if we do everything right from now on, and the timeframe in which we need to do it. We need to communicate the urgency, in other words, do we have a dynamic actor who can play the part and really make the point in a very action-packed way? Right Brian? Go ahead.



Dr. Brian von Herzen (The Climate Foundation): Oh I agree. In fact we're in production in two films this year. One in the E.U. and one in Australia, on restoring productivity in the oceans with marine permaculture. By the way we are expecting a positive net present value to this commercialization scenario. Rocky Mountain Institute and my friend Amory Lovins says there's a \$5.5 trillion positive net present value to being green. So we must articulate this to investors so we can have a zero cost solution. But furthermore, we do need to articulate effectively to the public that they have an enormous vested interest in sustaining civilization, which is what's on the table today.



This scientist re-wires frogs to grow extra limbs. Could it work in humans?

Future Energy eNews, January, 2018 (originally appeared in Popular Science, Dec. 2016)
<https://www.popsci.com/body-electrician-whos-rewiring-bodies>

Story #3 is a medical breakthrough that has been proven for years with lower life forms. It is about a limb regeneration with applied electricity, following the late doctor Robert Becker's famous book, The Body Electric (article excerpt below). In the meantime, for those interested in further research, our Bioelectromagnetic Healing book is available on Amazon or through IRI website. - TV

Sparking life into severed stumps to make them regrow is not all that new. In the 1970s, pioneers such as biologists Lionel Jaffe and Richard Borgens showed they could ignite the beginnings of limb regeneration in frogs by applying electrical currents. But they had conducted their experiments with simple batteries. Levin is the first to precisely tweak bioelectric signals at the cellular level, and to try to crack the code for what it means to those cells. At Tufts, he built a complex toolbox to do this. Among those tools: neurotoxins and drugs that block ion channels that would otherwise stay open, or open those that would stay shut; RNA that also codes for new channels, which Levin injects into cells via glass micropipette; molecules that can transport ions through cell membranes; and genes that code for ion channels (discovered by brain, kidney, and gut specialists). He tracks the impact of



voltage changes using fluorescent proteins and dyes, which grow brighter as the voltage gradient rises. In doing so, he has created a startling Island of Dr. Moreau zoo of freaks. He forced tadpoles to grow an eye on their gut; induced frogs to sprout six legs; and caused worms to grow two heads, which, when severed, will grow back just like a salamander's severed tail—all by manipulating the faintest of bioelectric signals.

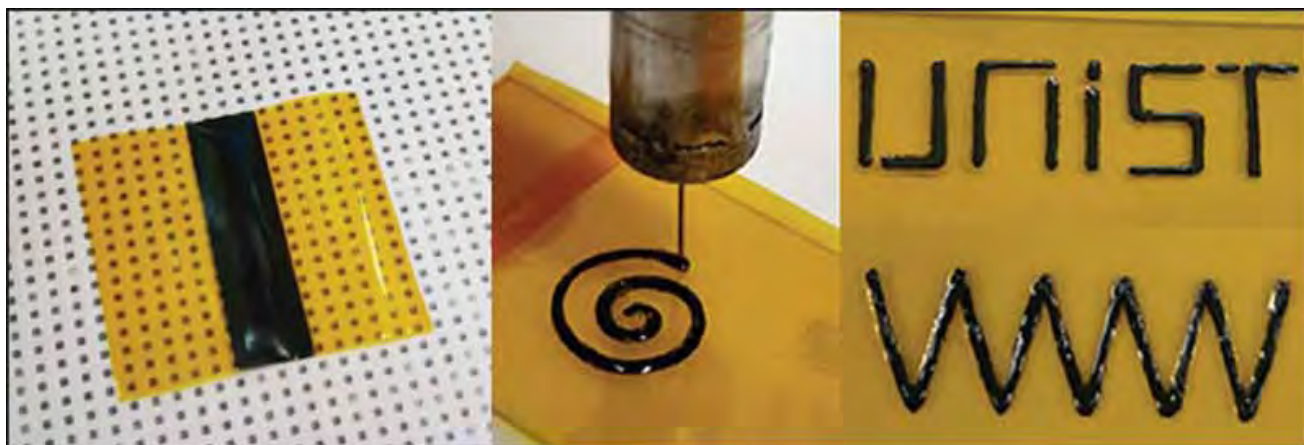
He now thinks—no, he knows—he will one day do the same for humans. So if a soldier loses an arm to a bomb on the battlefield, he will simply grow a new one. “I don’t know if it will be faster than the normal process of human fetal growth,” says Levin, sitting in his laboratory office at Tufts University where he now works, tending his creations as well as a jungle of houseplants. “Worst-case scenario: If you get your arm blown off at 25, by 35 you will have a teenager’s hand, which is very functional.”

Levin faces challenges to do the same for humans, or any warm-blooded mammal. First, warm-blooded animals have much higher blood pressure than reptiles. So there’s a huge risk of bleeding out if the wound is not papered over with a scab. Second, warm-blooded limbs tend to grow more slowly, allowing a greater risk that infection will take hold. And just as with any animal, the body attacks infection with inflammation, which could inhibit cellular growth. Also, to conduct electrical current around a wound, it must stay moist and be protected from air.

Wearable Solar Thermoelectric Generator

This energy-harvesting system generates electricity by attachment to clothes, windows, or outer building walls.

Future Energy eNews, Feb. 2018, originally appeared in *NASA Tech Briefs*, Feb. 1, 2018



Photograph of the TE ink printed in various shapes with curves and straight lines.

UNIST, Ulsan, Republic of Korea

Energy harvesting is a diverse field encompassing many technologies that involve a process that captures small amounts of energy that would otherwise be lost as heat, light, sound, vibration, or movement. A thermoelectric generator (TEG) is a device that converts waste heat energy — such as solar energy, geothermal energy, and body heat — into additional electrical power.

There has been a great increase in the study of wearable thermoelectric generators using the temperature difference between body heat and the surrounding environment. One of the main drawbacks of wearable TEG techniques driven by body heat is that such temperature difference is only 1 to about 4 °C, and this has hindered further commercialization.

This issue of low temperature difference faced by conventional wearable TEGs was solved in this work by introducing a local solar absorber on a polyimide PI substrate. The solar absorber is a five-period Ti/MgF₂ superlattice in which the structure and thickness of each layer was designed for optimal absorption of sunlight. This has increased the temperature difference as high as 20.9 °C, which is the highest value of all wearable TEGs reported to date. This new device is based on a temperature difference between the hot and cold sides. The wearable solar thermoelectric generator is expected to improve the efficiency by raising the temperature difference.

The noble wearable solar thermoelectric generator (W-STEG) was designed by integrating flexible BiTe-based TE legs and sub-micron-thick solar absorbers on the PI substrate. The TE legs were prepared by dispenser printing with an ink consisting of mechanically alloyed BiTe-based powders and an Sb₂Te₃-based sintering additive dispersed in glycerol. A W-STEG comprising 10 pairs of p-n legs has an open-circuit voltage of 55.15 mV, and an output power of 4.44 μW when exposed to sunlight.

For more information, contact Joo Hyeon Heo at joohyeonheo@unist.ac.kr ; 052 217 1223.

Good Vibrations? California to Test Using Road Rumbles as a Power Source

Future Energy eNews, March, 2018, Originally in *IEEE Spectrum*, April, 2017, By [Philip E. Ross](#)

Energy harvesting makes the jump from mere man-size stuff to infrastructure

Why not go big by harvesting the road vibrations caused by cars and trucks?



That's the idea behind California's newly funded experiment to turn road rumble into watts. It would rely on piezoelectric crystals, which produce a bit of current when you squeeze them. Such crystals are often used in audio equipment to turn sounds into signals or vice-versa, but if you put enough of them together, they could run streetlights, sensors, and other useful highway equipment.

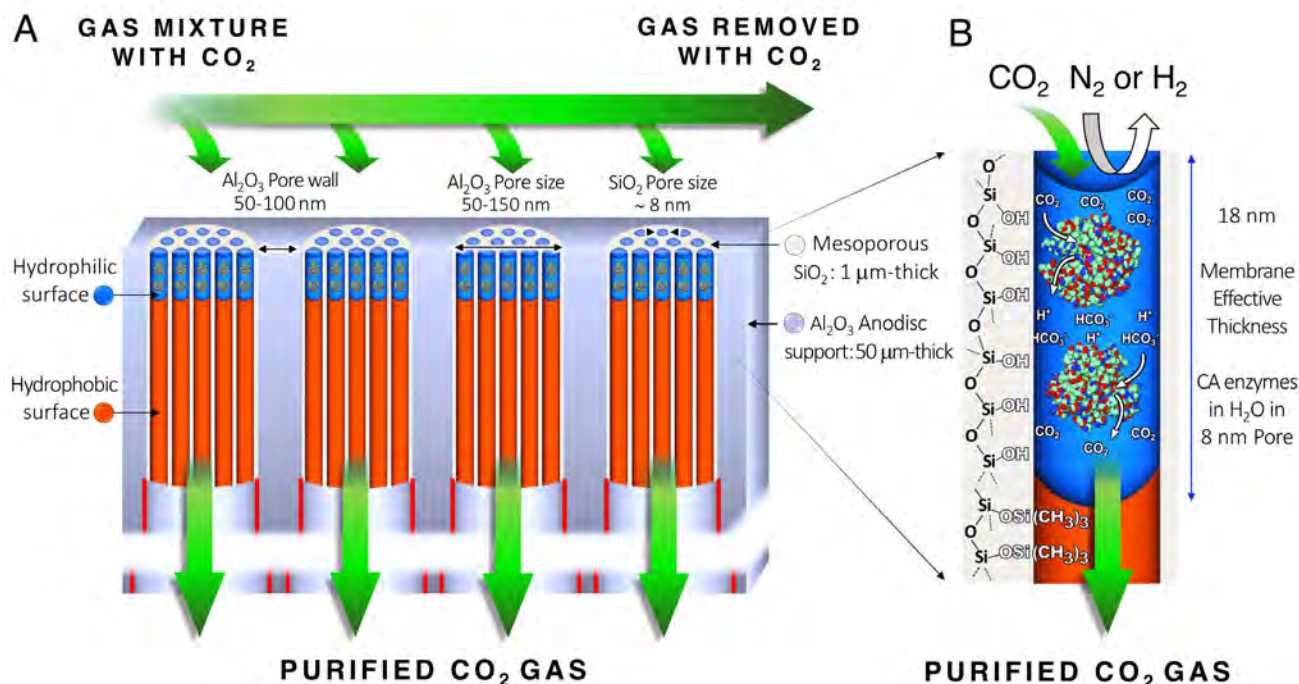
A total of US \$2.3 million will be invested in two projects. First up, a 60-meter (200 foot) stretch of roadway near the campus of the University of California, Merced, north of Fresno, will salt the pavement with 2-centimeter-wide piezoelectric generators "stacked like quarters," as Jian-Qiao Sun, an engineering professor at the school, told the *San Francisco Chronicle*. The other project, to be run by [Pyro-E](#), LLC of San Jose, will use similar devices to generate power for off-road use; the company speaks of scavenging enough power to supply 5,000 homes.

If the experiment proves out, California state officials say the system would be expanded to other roads. By recovering energy that would have gone to waste, such systems count as renewable energy sources under the state's green-energy policy. The problem is that nothing, not even waste energy, comes for free. Installing generating devices and keeping them running would add to the costs of road maintenance. And engineers might be tempted to design the roads to vibrate just a little more than otherwise so as to increase the efficiency of the harvesting—thus causing the roads to crumble even faster. The true economic break-even point would be hard to estimate, and it might be all too easy for piezoelectric proponents to convince themselves that they're getting a free lunch when they aren't. Israeli startup Innowattech, tried a similar technology in 2010 but Innowattech is now going out of business.

Membrane Purges Smokestack Emissions of Greenhouse Gases

Future Energy eNews, April, 2018, from *Machine Design*, April 17, 2018, [S. Mraz](https://tinyurl.com/y48ledh4) , <https://tinyurl.com/y48ledh4>

A biologically inspired material can remove carbon dioxide from coal-powered electric plants. “This is almost 70% better than current commercial methods, and it’s done at a fraction of the cost,” says Sandia National Laboratories fellow and University of New Mexico regents’ professor Jeff Brinker who led work to develop the inexpensive memzyme that can rid coal smoke of carbon dioxide.



Scientists at the Sandia National Laboratory have developed a “memzyme,” a membrane nearly saturated with carbonic anhydrase, an enzyme cells use to rid themselves of carbon dioxide quickly and efficiently. The patented work has grabbed the attention of energy companies that would like to significantly and inexpensively reduce carbon dioxide emissions, one of the most widespread greenhouse gases, and explore other possible uses of the invention. The memzyme meets the Department of Energy’s standards by capturing 90% of power plant’s carbon dioxide production at a relatively low cost of \$40 per ton. “To date, stripping carbon dioxide from smoke has been prohibitively expensive using the thick, solid, polymer membranes currently available,” says Jeff Brinker, a Sandia fellow. “Our inexpensive method follows nature’s lead in its use of a water-based membrane only 18 nanometers thick that incorporates natural enzymes to capture 90% of carbon dioxide released.

The gas can be harvested with **99% purity**, so pure it could be used by oil companies for resource extraction. Other molecules pass the membrane’s surface undisturbed. The enzyme is reusable, and because the water serves as a medium rather than an actor, does not need to be replaced. The nanopores dry out over time due to evaporation. This will be checked by water vapor rising from lower water baths already installed in power plants to reduce sulfur emissions. And enzymes damaged from use over time **can easily be replaced**. “The high concentration of carbonic anhydrase, along with the thinness of the water channel, result in high carbon dioxide flux through the membrane,” explains Brinker. “The greater the carbonic anhydrase concentration, the greater the flux. The thinner the membrane, the greater the flux.”

The membrane's arrangement in a generating station's flue would be like that of a catalytic converter in a car, suggests Brinker. The membranes would sit on the inner surface of a tube arranged like a honeycomb. Flue gas would flow through the membrane-embedded tube, with a **carbon dioxide-free gas stream** on the outside of



the tubes. Varying the tube length and diameter would adjust the carbon dioxide extraction process. "Energy companies and oil and gas utilities have expressed interest in adjusting gas filters for specific conditions," says Susan Rempe, a Sandia researcher. "The enzyme can catalyze the dissolution of a million carbon dioxide molecules per second, vastly

improving the process' speed. With improvements by Industry, the memzyme **could make electricity production cheap and green.**" The separation process could increase the amount of fuel obtained by enhanced oil recovery using carbon dioxide injected into existing reservoirs. A slightly different enzyme, used in the same process, converts methane—an even more potent greenhouse gas than carbon dioxide—into the more soluble methanol for removal. The procedure also could sequester carbon dioxide on a **spacecraft** because the membranes operate at ambient temperatures and are driven solely by chemical gradients.

Coal power plants are one of the United States' largest energy producers, but they have been criticized by some for sending more carbon dioxide into the atmosphere than any other form of electrical power generation. Still, coal burning in China, India, and other countries means that U.S. abstinence alone is not likely to solve the world's climate problems. The device's formation begins with a drying process called evaporation-induced self-assembly, first developed at Sandia by Brinker 20 years ago. The procedure creates a closely-packed array of silica nanopores that will hold carbonic anhydrase covers the water-averse surface to make the nanopores water-loving or hydrophilic, but only to a depth of 18 nanometers. A solution of the enzyme and water spontaneously fill up and are stabilized within the water-loving portion of the nanopores. This creates membranes of water 18 nanometers thick, with a carbonic anhydrase concentration 10 times greater than aqueous solutions made to date. The solution, at home in its water-loving sleeve, is stable. **But the enzyme can rapidly and selectively dissolve carbon dioxide**, so the catalytic membrane captures most of the carbon dioxide molecules that brush up against it in a rising cloud of coal smoke. Captured molecules pass rapidly through the membranes, driven solely by the naturally occurring pressure gradient caused by the large number of carbon dioxide molecules on one side of the membrane and their comparative absence on the other. The chemical process turns the gas briefly into carbonic acid and then bicarbonate before exiting immediately downstream as carbon dioxide gas. The gas can be harvested with 99% purity, so pure it could be used by oil companies for resource extraction. Other molecules pass the membrane's surface undisturbed. The enzyme is reusable, and because the water serves as a medium rather than an actor, does not need to be replaced.

A slightly different enzyme, used in the same process, converts methane—an even more potent greenhouse gas than carbon dioxide—into the more soluble methanol for removal.

The procedure also could sequester carbon dioxide on a spacecraft because the membranes operate at ambient temperatures and are driven solely by chemical gradients. The high enzyme concentration and short diffusion path maximizes capture efficiency and flux. (Image courtesy of Sandia National Laboratories)

Wireless Charging of Moving Electric Vehicles

FUTURE ENERGY ENEWS, MAY, 2018 REPRINTED FROM NASA TECH BRIEFS, FEBRUARY 1, 2018 | [ENERGY](#) | [AUTOMOTIVE](#) | [LIGHTING](#)

Stanford University, Palo Alto, California

<https://www.techbriefs.com/component/content/article/tb/techbriefs/energy/28298>

If electric cars could recharge while driving down a highway, it would virtually eliminate concerns about their range and lower their cost, perhaps making electricity the standard fuel for vehicles. Researchers have wirelessly transmitted electricity to a nearby moving object, which could advance wireless charging of vehicles and personal devices such as cellphones, and untether robotics in manufacturing.



[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Wireless charging would address a major drawback of plug-in electric cars: their limited driving range. Electric vehicle batteries generally take several hours to fully recharge, so a charge-as-you-drive system would overcome these limitations. A coil in the bottom of the vehicle could receive electricity from a series of coils connected to an electric current embedded in the road.

Mid-range wireless power transfer is based on magnetic resonance coupling. Just as major power plants generate

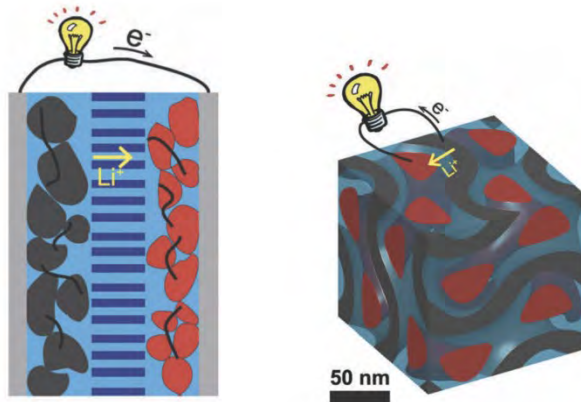
alternating currents by rotating coils of wire between magnets, electricity moving through wires creates an oscillating magnetic field. This field also causes electrons in a nearby coil of wires to oscillate, thereby transferring power wirelessly. The transfer efficiency is further enhanced if both coils are tuned to the same magnetic resonance frequency and are positioned at the correct angle. The continuous flow of electricity, however, can only be maintained if some aspects of the circuits, such as the frequency, are manually tuned as the object moves. So, either the energy transmitting coil and receiver coil must remain nearly stationary, or the device must be tuned automatically and continuously — a significantly complex process.

To address this challenge, the researchers eliminated the radio-frequency source in the transmitter and replaced it with a commercially available voltage amplifier and feedback resistor. This system automatically determines the right frequency for different distances without the need for human interference. Adding the amplifier and resistor allows power to be efficiently transferred across most of the three-foot range, and despite the changing orientation of the receiving coil. This eliminates the need for automatic and continuous tuning of any aspect of the circuits. *Watch a video demonstrating the device on Tech Briefs TV [here](#). For more information, contact Shanhui Fan at shanhui@stanford.edu; 650-724-4759.*

Revolutionary 3D nanohybrid lithium-ion battery could allow for charging in just seconds

Future Energy eNews, June 2018, from May 21, 2018, Kurzweil Digest, <http://www.kurzweilai.net/revolutionary-3d-nanohybrid-lithium-ion-battery-could-allow-for-charging-in-just-seconds>

Design also prevents fires in mobile devices



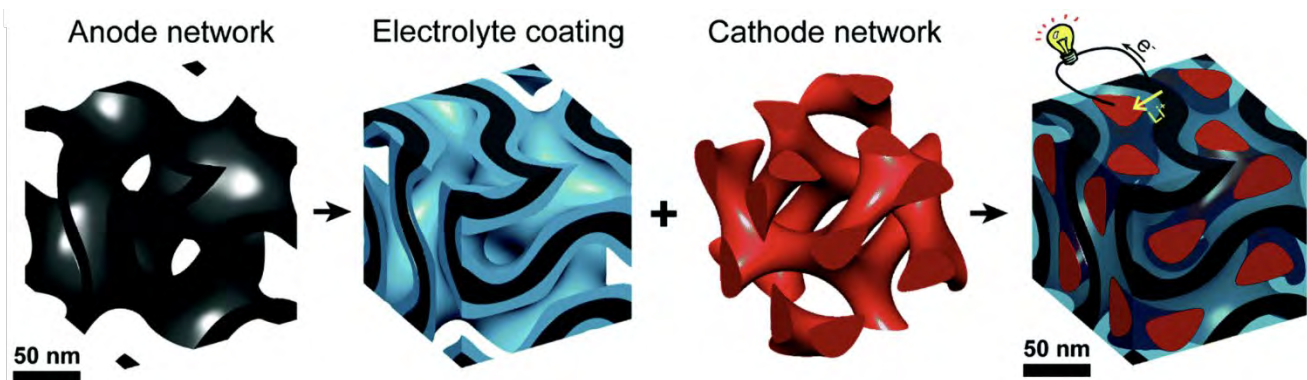
Cornell University engineers have designed a revolutionary 3D [lithium-ion battery](#) that could be charged in just seconds.

In a conventional battery, the battery's anode and cathode* (the two sides of a battery connection) are stacked in separate columns (the black and red columns in the left illustration above). For the new design, the engineers instead used thousands of nanoscale (ultra-tiny) anodes and cathodes (shown in the illustration on the right above).

Putting those thousands of anodes and cathodes just 20 nanometers (billionths of a meter) apart dramatically extends the area, allowing for extremely fast charging** (in seconds or less) and also allows for holding more power for longer.

In addition, unlike traditional batteries, the electrolyte battery material does not have pinholes (tiny holes), which can lead to short-circuiting the battery, giving rise to fires in mobile devices, such as cellphones and laptops.

The engineers are still perfecting the technique, but they have applied for patent protection on the proof-of-concept work, which was funded by the U.S. Department of Energy and in part by the National Science Foundation.



Left-to-right: The anode was made of self-assembling (automatically grown) thin-film carbon material with thousands of regularly spaced pores (openings), each about 40 nanometers wide. The pores were coated with a 10 nanometer-thick electrolyte* material (the blue layer between the black anode layer, as shown in the “Electrolyte coating” illustration), which is electronically insulating but conducts ions (an ion is an atom or molecule that has an electrical charge and is what flows inside a battery instead of electrons). The cathode was made from sulfur. (credit: Cornell University)

Reference: [Energy & Environmental Science](#) (open source with registration) March 9, 2018. Source: [Cornell University](#) May 16, 2018.

Science Behind PEMF Therapy and How It Can Fix Your Pain

Future Energy eNews, June, 2018, from BulletProof Blog, By: [COURTNEY SPERLAZZA, MPH](#)
<https://blog.bulletproof.com/pemf-therapy/>

- Mitochondria, the battery packs of your cells, and how strong they are affects everything you do. What if you could charge up your mitochondria directly — in a sense, plug them in? PEMF therapy comes pretty close.
- PEMF therapy uses bursts of low-level electromagnetic radiation to heal damaged tissues and bone, to relieve injury-related pain, and even to stimulate organs.
- It's a safe level of EMFs. The therapeutic frequency of PEMFs look a lot like the frequencies you encounter in nature, so your body knows how to deal with it. Most PEMF treatments and maintenance will fall in the 5-30 Hz range, which is less than you get from a thunderstorm.

PEMF therapy uses bursts of low-level electromagnetic radiation to heal damaged tissues and bone, to relieve injury-related pain, and even to stimulate organs. The idea is that pulses at low frequencies will pass through the skin and penetrate deep into muscle, bones, tendons, and even organs to activate the cell's energy and encourage its natural repair mechanisms. PEMF is catching on as a non-invasive way to approach injuries, chronic pain, and even chronic conditions like depression and diabetes. You may have heard that electromagnetic fields (EMFs) that come from things like wireless routers, microwaves, and airplanes disrupt your biology. EMFs can alter your DNA[1][2][3][4] and reconfigure your genes,[5][6] which can leave your cells not really knowing what to do. That can result in a lot of havoc, ranging from being tired all the time or ending up with DNA damage and cancer.[7]

PEMF therapy isn't the same thing. Frequency and duration make all the difference.

Here's what scientists were able to demonstrate about PEMF therapy so far:

- PEMF measurably reduced pain and swelling following plastic surgery^[8]
- A sizeable body of research shows that PEMF helps slow-healing tibial fractures fuse^{[9][10][11]}
- A small study demonstrated that PEMF therapy reduces pain from chronic pain conditions and fibromyalgia^[12]
- Animal studies show the potential of PEMF therapy in regenerating nerve fibers in the spinal cord and peripheral nerves, which is promising for the future of regenerative medicine^[13]
- In cell cultures, PEMF treatment seemed to activate lysozyme, which is a major step in the bone regeneration process.^[14]
- Treatment with PEMF improved osteoarthritis by keeping cartilage from breaking down^[15]
- PEMF impacted the growth of bone cells in cell cultures, which formed bone tissue in lab tests^{[16][17][18]}
- In a small study, people with rotator cuff injuries went through PEMF therapy, and all participants had either reduced or eliminated symptoms.^[19]
- Just one month of PEMF treatment improved pain and functional performance in arthritis patients^[20]
- PEMF therapy helped regenerate the liver faster in rats who had part of the liver removed^{[21][22]}



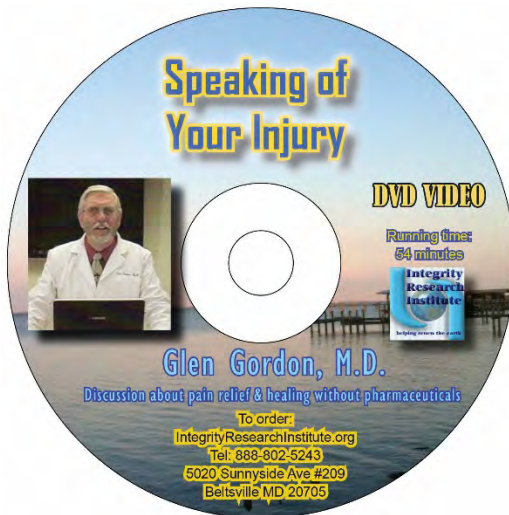
You can get PEMF therapy one of two ways: you can go to a professional, usually a physical therapist or chiropractor, or you can get PEMF equipment to use at home. Currently, insurance doesn't cover the cost of PEMF therapy, so prepare to pay \$30-60 per session. If extended therapy is needed, usually the clinic will offer session packages that will save you some money over the course of your treatment. If you're in the Santa Monica, California area, you can hit up Bulletproof Labs for PEMF treatments.

Or, you can get your own equipment. PEMF devices aren't classified as regulated medical devices, so you don't need to be a doctor or a chiropractor to buy a PEMF device. If you can afford it, you can get a PEMF mat, pad, or ring. Affording it is the tricky part. The cheapest PEMF mats go for \$1,300 or more, and the prices go up from there. As with anything, you get what you pay for, and higher-quality devices run into five figures.

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Ed. Note: IRI also has a competitively priced line of **PEMF devices**, including the very popular **EM Pulser** and the **EM PulsePad**, both pictured below and patterned after Dr. Glen Gordon's original nanosecond risetime design. Lots of testimonials on the www.BioenergyDevice.org website signify to us that the public is benefitting from reversals of health challenges or simply a reduction in pain and inflammation. Even doctors are buying our products below and some use them in the Emergency Room. Dr. Gordon's DVD is free with either the EM Pulser or EM PulsePad, which come with a thirty day money back and one year warranty.



EM Pulser Specifications

- *Lightweight 5 oz.*
- *Portable – 1" x 2.5" x 5"*
- *Rechargeable Battery – Long Lasting – option AC adapter*
- *30 day money back guarantee*
- *1 year manufacturer's warranty*



Hyperloop: The future of high-speed travel?

Future Energy eNews, July, 2018, also published in Fox News, June 22, 2018,

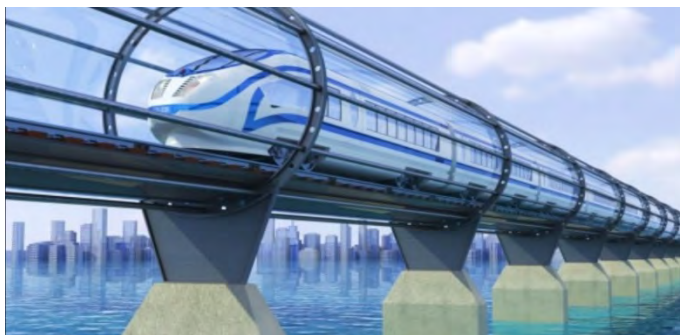
<https://www.foxnews.com/us/hyperloop-the-future-of-high-speed-travel>

Hyperloop: Engineers develop new high-speed form of travel

Hyperloop, or tube travel, will allow humans to travel faster than the fastest high-speed train; Douglas Kennedy shares the details.

Anita Sengupta believes that high-speed tube travel via Hyperloop is surprisingly similar to space travel, and she should know. As the lead systems engineer involved with parachute deployment of the Mars rover, she sent us where no one had gone before.

Now, as the Senior Vice President of Systems Engineering at Virgin Hyperloop One, Sengupta is bringing space travel down to earth, something she says is “inspired by science fiction, but now it’s science fact.”



The science behind Hyperloop will allow humans to go faster than the fastest high speed train. Even faster than some of the fastest planes in the sky. Sengupta told Fox News' Douglas Kennedy that passengers will be able to get from Kansas City to St Louis or from New York to Washington in 30 minutes or less.

“What we're doing is targeting a peak speed of 1,000 km per hour, which is roughly 700 miles an hour,” she explained.

The tubes create a low pressure environment that almost completely cuts out drag. Another key feature of this new form of travel is the motor, which will allow Hyperloop to completely change the way we travel. Picture a straightened out version of a conventional rotary motor.

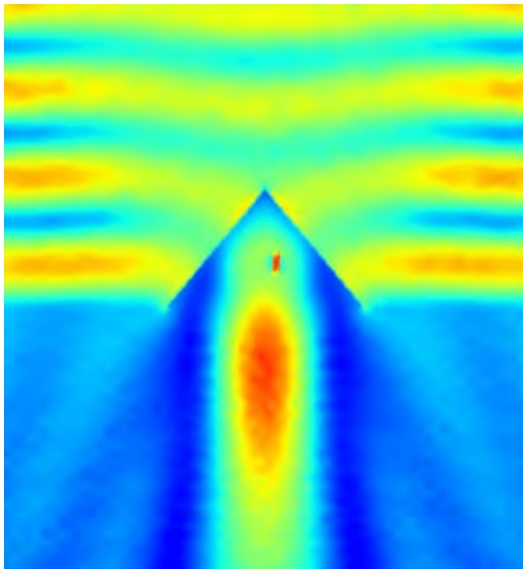
“It's called a linear electric motor and what that means is that you have a rotor and a stator, but they're actually stretched out so one portion is on the underside of our vehicle, which we call the pod, and the other side is on the bottom of the track,” Sengupta described.

Hyperloop One has successfully tested a loop out in the Nevada desert, which has already hit top speeds of 240 miles per hour, according to Sengupta. The current top speed is limited only by the fact that the experimental tube is only 500 meters long.

Chambers in Egypt's Great Pyramid concentrate radio waves

Future Energy eNews, August, 2018, adapted from Physics World, 10 Aug 2018

<https://physicsworld.com/a/chambers-in-egypts-great-pyramid-concentrate-radio-waves/>



Radio waves incident from above are focussed to a region below the pyramid (shown in red). Also in red are the waves concentrated in the rectangular King's Chamber within the pyramid. (Courtesy: Mikhail Balezin *et al* *Journal of Applied Physics*)

A theoretical study has modelled how radio waves behave when passing through the Great Pyramid of Giza in Egypt. Mikhail Balezin and colleagues at St Petersburg's ITMO University in Russia and Germany's Laser Zentrum Hannover used multipole analysis to approximate how the electromagnetic waves would be influenced by the famous landmark. As well as offering a new way to study interiors of huge structures, the technique is also being used to characterize pyramidal nanoparticles.

The interior of the Great Pyramid has been probed using various forms of radiation including cosmic muons. Indeed, the muon study has found evidence for a previously unknown chamber buried deep within the iconic structure. Now, Balezin and colleagues have performed the first study of how the pyramid would interact with radio waves. They constructed a numerical model to simulate the behaviour of radio waves with wavelengths of 200-600 m as they passed through a virtual pyramid. Such wavelengths were chosen because they are slightly longer than the physical dimensions of the Great Pyramid, which is about 140 m tall and measures 230 m along each of its four sides.

Solid limestone

The team first modelled the pyramid as solid limestone with no internal chambers. Then, they looked at how the presence of chambers would affect the radio waves. Their simulations predict that the chambers act as resonators, concentrating electromagnetic energy inside the chambers. They also found that the pyramid as a whole focused radio waves incident from above into a region just below the structure.

The team worked-out that some incident waves would be scattered by internal structures and that others would be absorbed. They were also able to map the distribution of electromagnetic fields inside the pyramid. The simulations used multipole analysis – a mathematical technique that can approximate interactions between complex objects and electromagnetic fields. The technique involves replacing the object with much simpler set of radiation emitters known as multipoles. With a knowledge of the properties of each individual multipole, the researchers could use mathematical functions to approximate how their combined emitted field would be scattered.

Similar scales

Normally, the team studies interactions between light and nanoparticles – where the wavelength of the light is also larger than the size of the structures of interest. This similarity inspired Balezin and colleagues to look at pyramids and show that on very different length scales of nanometres and hundreds of metres the scattering of electromagnetic waves ultimately depends on the size, shape and refractive index of the objects. The team is now looking at how pyramidal nanoparticles can be used in new and innovative ways to create new technologies such as nanosensors and highly efficient solar cells. The team also plans to do further simulations of the Great Pyramid using radio waves at shorter wavelengths.

The research is described in the *Journal of Applied Physics*.

Related Article: <https://physicsworld.com/a/muons-reveal-hidden-void-in-egyptian-pyramid/>

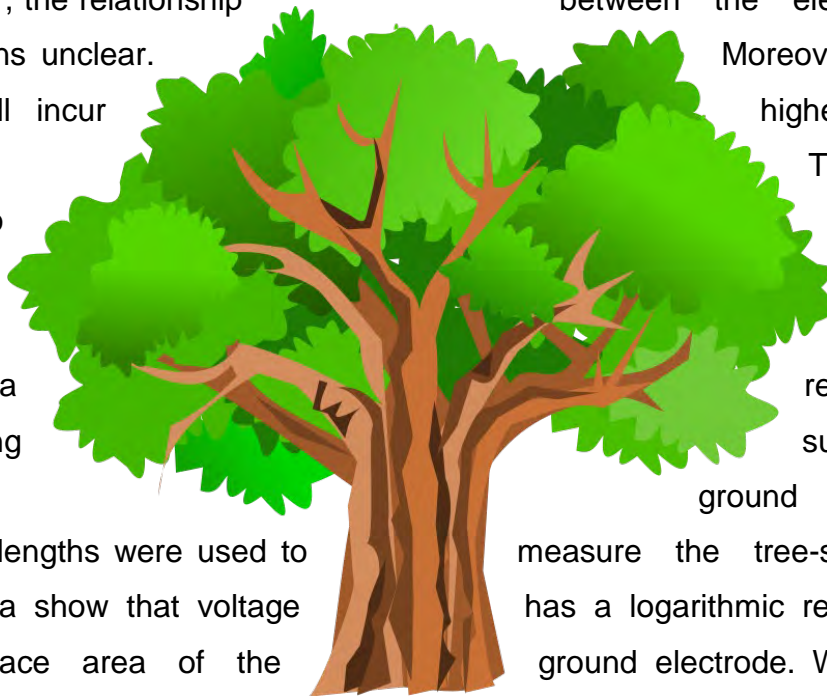
Effects of electrode size on the voltage of a tree-based energy generator

Future Energy eNews, Sept., 2018, adapted from *Journal of Renewable and Sustainable Energy* 10, 043101 (2018); <https://doi.org/10.1063/1.5032190> Zhibin Hao et al.

ABSTRACT

A standing tree and its surrounding soil form a sustainable energy generator, which is expected to decrease the need for in-the-field battery changes of low-power sensors used in forests, thereby enhancing forest monitoring technologies. Although various tree-powered circuits and sensors have already been invented, the low voltage of such a generator still causes great difficulty in energy harvesting and utilization. Hence, a key issue that must be addressed is the increasing voltage level. A larger electrode may generate a higher voltage level. However, the relationship between the electrode size and voltage remains unclear. Moreover, larger electrodes will incur higher costs and worsen portability.

Therefore, this study aims to preliminarily ascertain the effect of the electrode size on voltage and to provide a reference for optimally using such a generator. Six plate-shaped ground electrodes of different side lengths were used to measure the tree-soil voltage. The measured data show that voltage has a logarithmic relationship with the effective surface area of the ground electrode. With the increasing area of the electrode, the voltage rises by at least 57% relative to the initial value; however, its growth rate declines markedly. Therefore, a larger electrode size is not always better for a generator when considering efficiency, cost, and portability. In this study, an electrode size of 10 cm × 10 cm × 0.3 cm was found to be optimal.



https://aip.scitation.org/doi/10.1063/1.5032190?utm_source=AIP+Publishing&utm_medium=email&utm_campaign=9807426_ALERT_TOC_rse_20180901&dm_i=1XPS%2C5U7GI%2CO5IDSW%2CMTD4N%2C1&

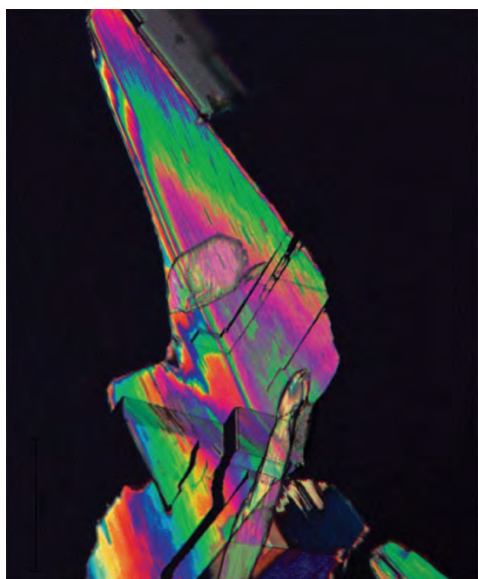
Bio-Renewable Process Creates “Green” Plastic

This process creates plastics from biomass, rather than petroleum.

Future Energy eNews, October, 2018, reprinted from NASA Tech Briefs, Oct. 1, 2018

<https://www.techbriefs.com/component/content/article/tb/techbriefs/manufacturing-prototyping/33104>

Plastics are often derived from petroleum, contributing to reliance on fossil fuels, and driving harmful greenhouse gas emissions.



A crystal of FDCA, a plastic precursor created with biomass instead of petroleum. (Image by Ali Hussain Motagamwala and James Runde)

Using a plant-derived solvent called GVL (gamma-Valerolactone), an economical and high-yielding way to produce furandicarboxylic acid (FDCA) was developed. One of 12 chemicals the U.S. Department of Energy calls critical to forging a “green” chemical industry, FDCA is a necessary precursor to a renewable plastic called PEF (or polyethylene furanoate), as well as to a number of polyesters and polyurethanes.

As the bio-based substitute for PET (polyethylene terephthalate) — its widely used, petroleum-derived counterpart — PEF is rich in potential. PET currently has a market demand of close to 1.5 billion tons per year, and a number of large companies have committed to developing a sustainably sourced, 100% plant-based PET for their bottles, packaging, apparel, and footwear. PEF's potential to break into that sizeable market, however, has been hampered by the high cost of producing FDCA. FDCA has had very low solubility in practically any solvent — a significant amount of solvent is necessary to make a small amount of FDCA, resulting in high separation costs and undesirable waste products.

The new process begins with fructose, which is converted in a two-step process to FDCA in a solvent system composed of one part GVL and one part water. Since sugars and FDCA are both highly soluble in this solvent, the end result is a high yield of FDCA that easily separates from the solvent as a white powder upon cooling. The solvent then can be easily separated and recycled.

The system doesn't require costly mineral acids for catalysis, doesn't produce waste salts, and the FDCA crystals can be separated from the solvent by simply cooling the reaction system.

For more information, contact James Dumesic at jdumesic@wisc.edu; 608-262-1095.

VIZIV TECHNOLOGIES, LLC PARTNERS WITH BAYLOR UNIVERSITY TO DEVELOP POTENTIALLY REVOLUTIONARY ELECTRICAL DISTRIBUTION TECHNOLOGY

Future Energy eNews, Nov. 2018, reprinted from <http://vizivtechnologies.com/news/>

*Waxahachie, Texas-based Viziv Technologies, LLC, joins five other ventures conducting research in the **Baylor Research and Innovation Collaborative**.*



WACO, Texas (August 27, 2018) – [Viziv Technologies, LLC](#), and Baylor University announce a new research partnership aimed at commercializing an entirely new means of delivering electrical energy wirelessly over long distances. Over four decades in development, Viziv’s systems use a phenomenon known as a [Zenneck surface wave](#) to propagate electromagnetic waves along the interface of earth and air. Viziv’s ultimate goal is to provide the capability to safely, economically and efficiently deliver electrical power virtually anywhere in the world through the use of surface wave technologies. Parallel research efforts at Viziv include the use of surface waves for communication, radio navigation, and sensing. Research within the Baylor collaborative will inform each of these applications as commercial development continues.

The partnership is the first university collaboration for Viziv, an angel-funded startup company with approximately 30 full-time employees spread among its Waxahachie, Milford and BRIC locations. The company foresees doubling its workforce over the next year.

“History is replete with examples of the power of people and organizations coming together to do what would be impossible individually,” said Viziv CEO and President, Brigadier

General (retired) Michael W. Miller. “Viziv Technologies’ young history is a great example of just that—strategic alliances determined to “Power the Planet and Bring Light to the World.” Our collaboration with Baylor University represents the first formal academic alliance for Viziv, and we are excited to officially begin what we expect to be a long and fruitful journey together.” Viziv is leasing 3,055-square-feet in the [Baylor Research and Innovation Collaborative](#), a 330,000-square-foot facility providing companies with access to the intersection of the BRIC’s five foundational pillars: fundamental and applied research, industry collaboration, business acceleration and incubation, workforce development and STEM educational outreach and research.

“As an electrical and computer engineering professor at Baylor, my colleagues and I were among the first to move our research into the BRIC in 2013,” said Viziv Chief Technology Officer, Randall Jean, Ph.D. “It is a world-class facility with an ever-expanding scope and depth of research capabilities. Within the ECE department, the programs in electromagnetics and power systems are among the strongest, making collaboration with Viziv Technologies a perfect fit for addressing a host of exciting challenges.”

The Viziv technology promises to make energy distribution safer and more reliable. A Zenneck surface wave is unaffected by lightning, geomagnetic disturbances, solar flares or electromagnetic pulses such as those generated by a nuclear blast such that only sending and receiving units will require protection. And unlike the electrical distribution systems that depend on a gridwork that is vulnerable to physical attack, and to cascading failures during peak power usage, wireless electrical delivery is designed to be virtually impervious to these threats. Plus, the field intensities generated are expected to be less than one percent of the current ANSI standards for safety in RF.

“Viziv fits the paradigm for BRIC collaboration about as well as any I can think of,” said Dr. Truell Hyde, Baylor Vice Provost for Research. “Currently about 17 percent of the world’s population have no access to electrical power, and for many more people, availability is spotty and unreliable. This technology has the potential to raise the standard of living for people around the world—who wouldn’t want to be a part of something like that?” For more information, please visit: www.baylor.edu/research or www.baylor.edu/bric

Ed. Note: This technology was pioneered by Dr. James Corum, who contributed a lengthy article on Zenneck Waves to the IRI book, *Nikola Tesla’s Electricity Unplugged*.

Porsche and BMW unveil EV charger that's three times faster than Tesla's

Future Energy eNews, December, 2018, adapted from The Verge, <https://www.theverge.com>
By [Jon Porter@JonPorty](mailto:Jon.Porter@JonPorty) Dec 14, 2018, 11:19am EST

Giving you 100 km of range in just three minutes

A research group with members including Porsche and BMW has unveiled a [new 450 kW charging station prototype in Germany](#) (via [New Atlas](#)),



which has a capacity of three times that of Tesla's existing Superchargers. Supplying that much power means that the new station, built by the FastCharge research group, could supply around 100 km (62 miles) of range in just three minutes, or charge a BMW i3 from 10 to 80 percent in 15 minutes. In contrast, Tesla's Superchargers currently have a [maximum capacity of 145 kW](#). However, FastCharge is unlikely to maintain this same lead for long: Tesla has already upgraded its network from 120 kW in the past, and it plans to increase the maximum capacity of its network to [250 kW next year](#).

THE PROTOTYPE PORSCHE TAYCAN USED IN THE DEMONSTRATION DREW A LITTLE OVER 400 KW

Unluckily for Tesla, this upgrade still won't be enough to make it the fastest charging network in America. It recently saw its first [350 kW charging station installed in California](#) by Electrify America.

FastCharge's new station might have a high theoretical capacity, but the actual amount of power drawn by average electric vehicles is likely to be considerably less for the time being — at least until the cars catch up. The prototype Porsche Taycan that was used in the demonstration (which is due to be released next year) only drew a little over 400 kW, while other vehicles such as the Audi E-Tron or Jaguar I-Pace can draw 150 kW and 100 kW, respectively. FastCharge's prototype station supports cars with both 400- and 800-volt battery systems, and it will automatically pick the best one to use when it's plugged into a vehicle.

There's also the problem of availability. Although FastCharge has its prototype charger up and running in Germany, it will take time for the infrastructure to become widely available. There are also still questions about the [power grid's ability to handle](#) a large amount of power-hungry charging stations delivering power all at once.

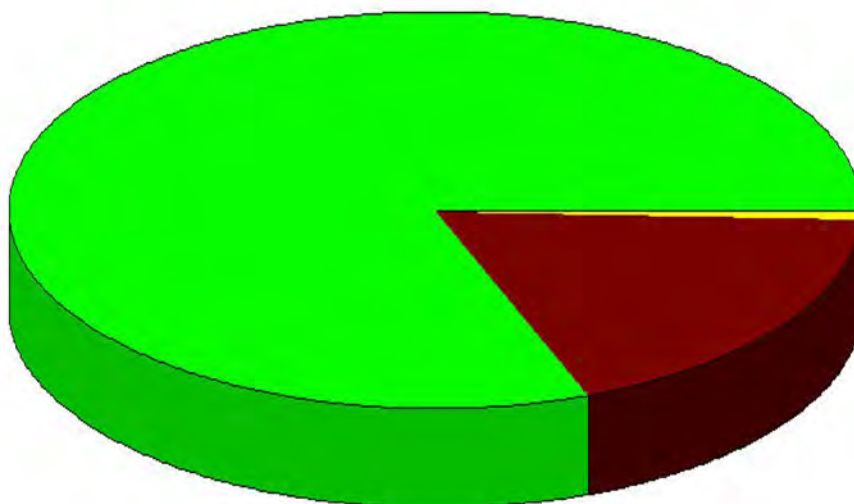
Outside of charging station availability, charge time has been one of the key challenges for electric vehicles to overcome. Even if a gas station installs dozens of charging stations, these will struggle to meet demand if cars need to be plugged in for half an hour at a time. Previously, Tesla has proposed measures including [replacing a car's battery entirely](#) to cut down on charging times, but now it seems simply pumping more power through a charging station might solve the problem after all.

IRI FINANCIAL REPORT 2018

Total Income: \$190,277.11

Income Summary
January through December 2018

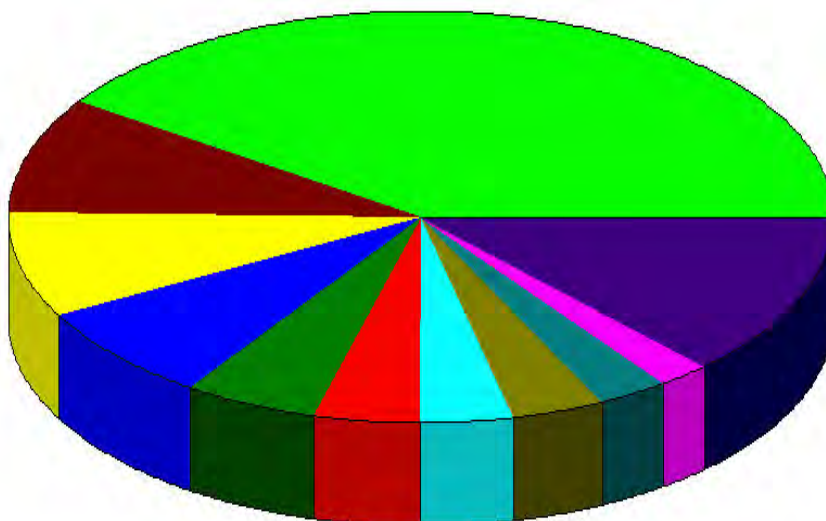
Sales	80.89%
Direct Public Support	18.51
Program Income	0.60
Total	\$190,277.11



Total Expenses \$179,980.35

Expense Summary
January through December 2018

Parts for products	40.74%
Travel and Meetings	9.22
Facilities and Equipment	8.33
Awards and Grants	7.73
Telephone, Telecommunications	5.37
Books printed	4.14
Other Types of Expenses	3.77
Shipping costs	3.77
Books, Subscriptions, Reference	2.85
Printing supplies	2.22
Other	11.87
Total	\$179,980.35





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