

# AMERICAN PHYSICAL SOCIETY

## *New England Section Newsletter*

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*Paul H. Carr & Laurence I. Gould, Co-Editors*

### **Fall 2011 Joint Meeting of the New England Sections of the APS and AAPT with participation of the SPS**



## **Climate Change and the Future of Nuclear Power**

**Friday and Saturday, November 18-19, 2011  
University of Massachusetts Amherst**

This year marks the 100th anniversary of Rutherford's discovery of the nucleus. He said it would be "moonshine" to think that we would ever be able to extract energy from the nucleus. But now nuclear power plants provide 15% of the electricity in the world without emitting greenhouse gases as do fossil fuel fired plants. But how will the Fukushima nuclear power plant disaster, and Germany's decision to drop nuclear power after 2022 affect the future of nuclear power? Are there new designs and procedures that will ensure safe operation?

The banquet speaker will be Bob Park of the University of Maryland, the author of the weekly news/editorial column "What's New." His topic will be "The Only Way of Knowing: As of today there are 7 billion people on this planet; according to the wireless industry, 5 billion of them have cell phones. It's possible to call anyone on Earth with a 2-ounce pocket mobile. The knowledge behind this politically-powerful technology did not come from sacred texts or government offices. The only way of knowing is by scientific observation and testing. In theory, the public learns from the media. As I will show, the media is not a reliable source."

Registration, abstract, housing, and other information may be found at

<http://blogs.umass.edu/nes2011>

## Invited Speakers

**Edward J. Calabrese**, Public Health, University of Massachusetts Amherst

*When Sciences Fails Society: Toxicology's 20th Century Legacy*

This presentation provides an assessment of hormesis, a dose-response concept that is characterized by a low-dose stimulation and a high-dose inhibition. It will trace the historical foundations of hormesis, its quantitative features and mechanistic foundations, and its risk assessment implications. It will be argued that the hormetic dose response is the most fundamental dose response, significantly outcompeting other leading dose-response models in large-scale, head-to-head evaluations used by regulatory agencies such as the EPA and FDA. The hormetic dose response is highly generalizable, being independent of biological model, endpoint measured, chemical class, physical agent (e.g., radiation) and inter-individual variability. Hormesis also provides a framework for the study and assessment of chemical mixtures, incorporating the concept of additivity and synergism. Because the hormetic biphasic dose response represents a general pattern of biological responsiveness, it is expected that it will become progressively more significant within toxicological evaluation and chemical and radiation risk assessment practices as well as having numerous biomedical applications. Particular application will be directed towards how hormesis may affect the risk assessment process for chemicals and ionizing radiation.

**Robert M. DeConto**, Geosciences, University of Massachusetts Amherst

*Climate Change and Sea Level Rise, Lessons from the Past and Models of the Future*

Recent observations of the polar ice sheets show an accelerating rate of fresh water input to the global ocean, yet the dynamic behavior of the ice sheets and the potential rate and magnitude of future sea level rise remain difficult to predict. New geological discoveries from the Arctic and Antarctic indicate a highly sensitive polar climate system, and far greater variability of the ice sheets than previously suspected. Here, we'll review some of these recent findings in the context of new climate and ice sheet modeling studies, providing a geological perspective on climate sensitivity and the potential response of the ice sheets to a warming world.

**Tyler Ellis**, Project Manager, TerraPower, Bellevue, Washington

*TerraPower's Traveling Wave Reactor*

TerraPower is moving forward with detailed plans for a sustainable, economic, and safe nuclear reactor. The Travelling Wave Reactor (TWR) – a reactor in the 500-megawatt electric range – uses unique core physics to initiate a breed and burn wave which can be completely sustained in fertile material. This process allows the TWR to convert depleted uranium waste into usable fuel as the reactor operates, providing a sustainable base-load power source. TerraPower is the first company to create a practical engineering embodiment of this previously studied concept thanks to a powerful advanced reactor modeling interface, developed in-house, which enables the analysis of traveling wave reactor technology in a way that has not been possible before. This presentation will provide more detail about the origins of the TWR, the project's current status as well as some of the safety differences between TWRs and currently operating light water reactors.

**Michael W. Golay**, Massachusetts Institute of Technology

*The Fukushima Nuclear Event and its Implications for Nuclear Power*

The combined strong earthquake and super tsunami of 12 March 2011 at the Fukushima nuclear power plant imposed the most severe challenges ever experienced at such a facility. Information regarding the plant response and status remains uncertain, but it is clear that severe damage has been sustained, that the plant staff have responded creatively and that the offsite implications are unlikely to be seriously threatening to the health, if not the prosperity, of the surrounding population. Reexamination of the regulatory constraints of nuclear power will occur worldwide, and some changes are likely; particularly concerning reliance upon active systems for achieving critical safety functions and concerning treatments of used reactor fuel. Whether worldwide expansion of the nuclear power economy will be slowed in the long run is perhaps unlikely and worth discussion.

**Klaus S. Lackner**, The Earth Institute, Columbia University

*Carbon Cycling with Nuclear Power*

Liquid hydrocarbon fuels like gasoline, diesel or jet fuel are the most efficient ways of delivering energy to the transportation sector, in particular cars, ships and airplanes. Unfortunately, their use nearly unavoidably leads to

the emission of carbon dioxide into the atmosphere. Unless an equivalent amount is removed from the air, the carbon dioxide will accumulate and significantly contribute to the man-made greenhouse effect. If fuels are made from biomass, the capture of carbon dioxide is a natural part of the cycle. Here, we discuss technical options for capturing carbon dioxide at much faster rates. We outline the basic concepts, discuss how such capture technologies could be made affordable and show how they could be integrated into a larger system approach. In the short term, the likely source of the hydrocarbon fuels is oil or gas; in the longer term, technologies that can provide energy to remove oxygen from carbon dioxide and water molecules and combine the remaining components into liquid fuels make it possible to recycle carbon between fuels and carbon dioxide in an entirely abiotic process. Here we focus on renewable and nuclear energy options for producing liquid fuels and show how air capture combined with fuel synthesis could be more economic than a transition to electric cars or hydrogen-fueled cars.

**Richard S. Lindzen**, Department of Earth, Atmospheric and Planetary Sciences, M.I.T.

*Climate v. Climate Alarm*

The underlying physics of climate contains important elements that are widely agreed on though frequently misunderstood. In this lecture, the basic physics of greenhouse warming are simply described. It will be shown that the dynamic mixing of the troposphere is essential to the mechanism. It will further be shown that there is nothing intrinsically alarming in the basic physics. Alarm depends critically on the assertion that the climate system is dominated by large positive feedbacks that greatly amplify such warming as may be due to increasing CO<sub>2</sub> alone. The nature of possible feedbacks will be described, and the conditions for observationally determining such feedbacks will be explained. It will be seen that the feedback factors, themselves, can be subject to fluctuations, so that large positive feedbacks could occasionally lead to instability. A variety of attempts to evaluate such feedbacks will be described. Some will be shown to be clearly incorrect. The remaining approaches suggest that feedbacks are small and even negative, suggesting little basis for alarm.

**Regis A. Matzie**, Westinghouse Electric Company LLC

*The Fundamentals and Status of Nuclear Power*

Nuclear power has enormous potential to provide clean, safe base-load electricity to the world's growing population. Harnessing this potential in an economic and responsible manner is not without challenges. Safety remains the principal tenet of our operating fleet, which currently provides ~20% of U.S. electricity generated. The performance of this fleet from economic and safety standpoints has improved dramatically over the past several decades. This nuclear generation also represents greater than 70% of the emission free electricity with hydroelectric power providing the majority of the remainder. There have been many lessons learned from the more than 50 years of experience with nuclear power and these have been factored into the new designs now being constructed worldwide. These new designs, which have enhanced safety compared to the operating fleet, have been simplified by employing passive safety systems and modular construction. There are applications for licenses of more than 20 new reactors under review by the U.S. Nuclear Regulatory Commission; the first of these licenses will be completed in early 2012, and the first new U.S. reactor will start operating in 2016. Yet there are still more improvements that can be made and these are being pursued to achieve an even greater deployment of nuclear power technology.

**Cavan Stone**, Physics, Dartmouth College

*The Liquid Fluoride Thorium Reactor: Energy Cheaper Than Coal*

This century, we face significant environmental challenges. Our demand for limited natural resources is rapidly increasing and much of humanity is concerned about the consequences. Our unsustainably growing population drives these challenges, and humanely stabilizing it would alleviate these pressures. Demographic data clearly shows that prosperity stabilizes population and it also shows that prosperity critically requires energy. In spite of the pressing and demonstrable nature of these challenges however, politically there is no international consensus on global energy policy. Developing nations simply will not accept a policy that will hamper their economic growth. Yet, we do have a solution to these challenges, an idea conceived and experimentally tested by Alvin Weinberg at Oak Ridge National Laboratory, the Liquid Fluoride Thorium Reactor. Presently, various laboratories and start-up companies, including the Chinese Academy of Sciences have begun efforts to commercialize the technology. By delivering the promise of inexpensive energy it will be in the economic interest of the developing nations to use this carbon-free energy source. By delivering superior performance on longstanding public concerns about nuclear energy, it will be technologically and politically feasible for developing nations to stabilize their population with the bounty of energy cheaper than coal.

## Spring 2011 Joint Meeting of the New England Sections of the APS and AAPT

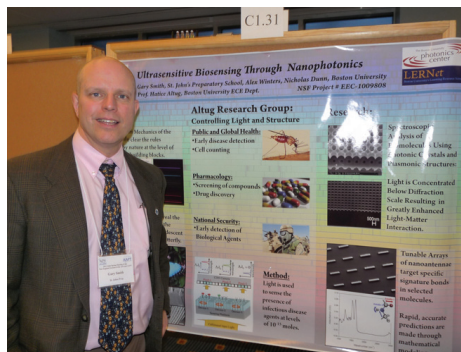
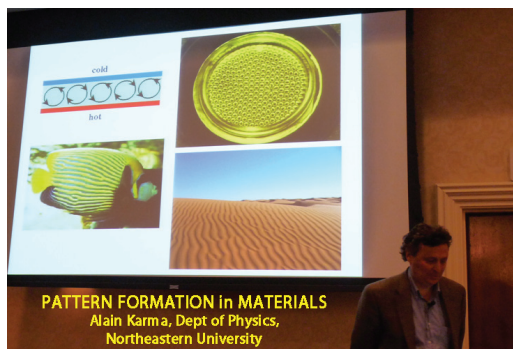
[Review and Contributions by Paul H. Carr]

### **Materials: The Foundation of Our Future**

Friday and Saturday, April 8 – 9, 2011  
University of Massachusetts Lowell  
Lowell, MA

[http://www.uml.edu/college/arts\\_sciences/Physics/APS-AAPT/](http://www.uml.edu/college/arts_sciences/Physics/APS-AAPT/)

The attendance was 208 including 80 students. Photographs of the meeting are below.



Gary Smith, St John's Preparatory School, with his poster paper "Untrasensitive Biosensing Through Nanophotonics."



Paul H. Carr, Co-Editor & Frederick Wolf, Keene State College discuss the history of astronomy



### The make-believe world of real-world physics

Banquet Speaker: Eric Mazur  
 Balkanski Professor of Physics and Applied Physics  
 Harvard University, Cambridge, MA

That physics describes the real world is a given for physicists. In spite of tireless efforts by instructors to connect physics to the real world, students walk away from physics courses believing physicists live in a world of their own. Are students clueless about the real world? Or are we perhaps deluding ourselves and misleading our students about the real world?

Prof. Mazur expressed his concern for student perception by the following note from a student.

*Dear Professor,  
 I really don't believe that heavy  
 and light things fall at the same speed.  
 A feather and a stone, for example.  
 You kept saying that I'd get it  
 if I lived in a vacuum.  
 Do you live in a vacuum?  
 (written by Nin Andrews)*

Prof. Mazur should refer this student to this video of an Apollo 15 astronaut dropping a hammer and a feather on the moon: <http://www.youtube.com/watch?v=PE81zGhnb0w>

He also said that we physicists need to have more realistic illustrations in our textbooks. An example was the drawing of a man with a rope in his teeth by which he was pulling two railroad cars.

Prof. Mazur then showed a picture of a runner dropping a ball, which had three possible trajectories: A. falling backwards, B. falling straight down, and C. an elongated forward-falling parabola. The physicists at our dinner selected C as correct. However, when Mazur interviewed the general public in Harvard Square, Cambridge, they selected B as being consistent with their own experience. Mazur then showed a video of the runner with a falling ball. It showed a shallow forward-falling parabola. This is evidence that the general public's experience is closer to the real world than C, the elongated forward-falling parabola. In the runner's rest frame, he sees the ball as B, falling straight down.

## EDITORIALS and LETTERS TO THE EDITORS

*Please Note: The content of what follows expresses each writer's considered opinion and should not be construed as representing any official position of any organization, including the Executive Board of the New England Section of the American Physical Society.*

The issue of anthropogenic global warming (AGW) is not settled. This can be seen from the Letters below as well as contributions to the debate existing in recent publications of this Newsletter (Fall 2007 through Spring 2011 issues). These can be obtained from the NES APS website <http://www.aps.org/units/nes/newsletters/>.

Given the importance of the topic, we welcome letters (positive or negative) about the issues or *any other issues*. Examples might be: (1) Message from the Chair, (2) Interesting topics from NES APS institutions (such as new hires or new programs), (3) Message from the Nominating Committee Chair about positions to be filled on the Executive Board, or (4) Recent Executive Committee highlights. The Newsletter is published twice yearly (Fall and Spring).

—Paul Carr and Larry Gould, Co-Editors NES APS Newsletter

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### Paul Carr — Editorial Comments plus other Contributions

Paul H. Carr, attended the American Vacuum Society New England AVSNE-11 Meeting, Marriott Hotel Burlington, June 6, 2011, at the invitation of Dr. Peter Sommsich, Chairman, AVSNE. The technical papers at this meeting were of interest to me as an experimental physicist. The commercial exhibit of vacuum-related equipment filled a large room could represent an important expansion of our own APSNES meeting. I therefore recommend more cooperation with the AVSNE. The following is a general interest paper presented at the meeting.

#### **An E-cubed Policy for Scientists (and everyone): Energy, Employment and the Environment**

*David Gordon Wilson, Professor of mechanical engineering, emeritus, MIT*

##### **Summary**

The underlying principle of the proposed policy is to produce gradually increasing incentives for all parties in the US to reduce the \$1B per day we spend to import oil and increase “green” energy jobs. These incentives would come from fees put on fossil fuels and on easily measured (or fairly estimated) emissions. The fees would start at a low level and would be incrementally increased until a committee of Congress decides that the fee levels had reached an appropriate level. The fees would be entirely returned as rebates to everyone (through a reduction of income taxes, or as direct monthly transfers to bank accounts or to debit cards). Thus the policy would be progressive, whereas taxation of fossil fuels and of emissions is regressive. The rebates would be included in the evaluation of the cost of living so that there would be zero inflationary effects.

##### **Background**

The OPEC energy crisis of 1973 – 1980 brought sharp decreases in the supply and huge increases in the price of petroleum, and calls for rationing. It also resulted in the formation of thousands of new businesses as our science and engineering colleagues and other entrepreneurs developed more-efficient engines, solar cells, and a near infinity of other processes to make the US independent of oversea supplies. In 1980 the price of oil collapsed, and most of these activities shut down, putting large numbers of skilled people out of work.

*This contribution has not been peer-refereed. It represents solely the view(s) of the author(s) and not necessarily the views of APS.*

Two personal experiences are relevant. One was being asked to look at a cooling pump in the Quad Cities nuclear power plant in Cordova, IL. I was told to rent a car in Moline and to drive north by the frozen Mississippi (it was in a very cold January) until I saw a column of vapor coming from the cooling pond. My host was distressed that environmentalists (pronounced as if they were noxious snakes) prevented them from using the Mississippi for cooling. On the drive I learned that many local businesses were shut down because of the shortage of natural gas. Once inside the unbelievably overheated reception hall I congratulated my host for using the waste heat to heat the buildings. There was a painful silence. The nuclear power plant was using natural gas to heat the buildings. Geniuses in Congress had decided that poor people should not be overcharged for heating, and had decreed that Texas and Louisiana, then the prime US producers of natural gas, must not be allowed to charge more than \$1/million BTU, a level that made it totally uneconomic to look for more gas and gave a strong incentive to waste it by, e.g., using it to heat a power plant that had difficulty getting rid of its waste heat.

The last experience was the suggestion by a friend at MIT (Alan Altschuler) that I look at the shared-lunch syndrome. The tragedy of the commons is illustrated by a group of 20 who eat lunch every day at the same restaurant. One day, someone says “Let’s save the server writing out 20 checks. Just have her write one check and we’ll divide it by 20.” A smartass realizes that now he can order lobster thermidor and pay only 1/20 of the difference over the cost of his usual egg-salad sandwich. Within a week, everyone has copied him. They are all saying “Why is lunch so expensive, and why am I getting so fat?”

The incentives in the shared-lunch situation were so obviously negative and were so similar to the energy and other aspects of life in the US that I became obsessed with the need to reverse these incentives. I also wanted to reverse some of the effects produced by simply taxing fossil fuels and the emissions of pollutants. One is that there is an immediate inflationary increase: more expensive fuel puts up the price of almost everything in the “basket” of goods and services that is used to evaluate the cost of living. A second is that price increases hurt the poor more than the rich. A third is that taxes on this huge a scale put vast amounts of money at the disposal of Congress and the administration to build bridges to nowhere and monuments to members’ worthiness.

### **Problems in an early launch**

I launched an early version of the policy during the 1970s energy crisis and testified on it five times before Congressional committees. (This didn’t stop academic and other plagiarists from claiming credit for it, sometimes decades later. One told me recently that I should feel gratified that he and others copied my concept, because it showed that it had high value!) I like to point out that if it had been adopted during the crisis period, a large proportion of the funds in the price increases would have stayed in this country, and that there would have been no collapse of the many enterprises that were developing technologies to insure us against future such uncertainties in supply. Subsequently I have introduced various improvements in the policy that the plagiarists have so far ignored.

### **Inevitable consequences of the proposed policy**

1. The use of fossil fuels – natural gas, gasoline, diesel and fuel oil, coal, etc. – and emissions of pollutants would be gradually but strongly reduced. The one-billion dollars we spend every day to buy non-US fuel would also be reduced.
2. Business in general would rejoice at the reduction in uncertainty about energy prices and, in consequence, would make vigorous plans for future developments of all kinds.
3. Inventors, entrepreneurs, individuals and companies would start projects to produce energy from

wind, sun, biomass etc. and to reduce emissions in ways governed by the market, and would hire huge numbers of people to work in them.

4. All these new employees would start paying taxes, reducing the country's deficit.
5. People would start buying more-efficient vehicles, using buses more, walking and bicycling when convenient, buying better home-heating systems, refrigerators etc., using their rebates.
6. Poor people would get a little richer because their energy and other expenditures would increase less than those of the rich, but they would get the same rebates. They would receive something like a guaranteed income and have greater self-pride. If the rebates continued to increase, virtually all would come off welfare.
7. The rich would pay out more than they would get in their rebates. However, they would have far more freedom than do the poor to change their lifestyles. They would buy everything available to lower costs: fuel-efficient cars, air-conditioning systems, LED lighting, photo-voltaic generators and so on.
8. Congress would have the right to roll back, stop or accelerate increases in any individual fees put on energy or emissions at any time. They would be hearing cries of joy from many and of anguish from the rich. They might even receive evidence that would convince them that global warming has been exaggerated, and they might therefore decide to roll back fees. All these possibilities would be democratic applications of Congressional power if pressures came from voters rather than from lobbyists.
9. Congress would be discouraged from advocating one technology over another, because the modified free market would work its magic.
10. The government could cease to put stimulus money from our taxes to increase employment and to decrease the use of fossil fuels etc. The deficit would drop fast.
11. Almost the only expenditure required of the government would be for the system for transferring the monthly rebates – surely a relatively low-cost operation - and a step up of enforcement on people seeking opportunities to cheat.

This policy would shrink government, would provide incentives for all of us to solve problems, and would greatly reduce government expenditures. This table shows estimates of some of the effects.

**ESTIMATES OF EFFECTS OF A BILL TO REDUCE NONRENEWABLE ENERGY USE, TO STIMULATE NEW TECHNOLOGIES AND EMPLOYMENT IN THEM, TO ADVANCE THE USA INTO A POSITION OF LEADERSHIP IN GLOBAL ENVIRONMENTAL PROTECTION, AND TO AID THE U.S. POOR.**

*(Revision 2, 2011 01 12)*

Months after enactment	6	6-9	09-12	12-15	15-18	18-21	21-24	24-30	30-36	36-42	42-48	48-60	60-72
Fee on fossil fuels, \$/500 MJ	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent cents/gallon	0	25	50	75	100	125	150	175	200	225	250	275	300
Expected % reduction in use	1	8	12	16	20	24	28	31	34	37	40	42	44
Expected % decrease in unemployment	1.5	2.5	3.5	4.5	5.5	6	6.5	7	7.5	8	8	8	8
Total fees from fossil fuels, trillion dollars	0	0.46	0.88	1.26	1.60	1.90	2.16	2.41	2.64	2.83	3.0	3.19	3.36
Monthly rebate per person, \$	0	68	130	186	237	281	320	357	390	419	444	472	497
Government distribution costs, \$million	75	100	75	10	9	8	7	12.5	12.5	12.5	12.5	25	25
Government accreditation and anti-fraud costs, \$million	25	25	25	25	25	25	25	50	50	50	50	100	100
Savings from reduction of government funding etc.	?	?	?	?	?	?	?	?	?	?	?	?	?
Points at which other energy technologies become viable without subsidies			Biomass Geothermal Hydro			On-land wind						Off-shore wind	



**NOTES**

1. *No fees are put on fossil fuels during the six months after enactment, to allow time for preparation. This delay could be varied to be shorter or longer.*
2. *After the six-month fallow period, fees on all fossil fuels are started at \$1.00 per 500 MJ, which for gasoline is about 25 cents per gallon. The fee is increased by a further \$1.00/500MJ each quarter until two years after enactment, after which the increase occurs every six months for two years, and thereafter every year. The starting fee could be increased or decreased. Its rate of increase could be speeded up or slowed down by Congress. Different starting fees and rates of change could be applied to different fuels. We prefer the uniform fee applied to the energy value in the fuels coupled with an additional fee on the emissions from the different fuels and power systems being charged as in 5 below.*
3. *The expected decreases in fossil-fuel use and in unemployment are from the conditions at enactment.*
4. *The savings in government expenditures on energy, environment welfare etc., many of which would no longer be required, would be large: We have not attempted to estimate them*
5. *Either simultaneously or subsequently fees would be required from emitters of greenhouse and toxic gases such as methane, NOx, CO and CO2, where they can be estimated or measured fairly and inexpensively, and the collected fees would be deposited in the same trust fund and distributed. We recommend as a starting point the fees for carbon derived from the carbon taxes in British Columbia (see below.)*
6. *The points at which other energy technologies would become viable without subsidies are taken from the Annual Energy Outlook, 2010: DOE/EIA-0383(2009) Solar thermal and solar PV would become viable at a higher range of fuel fees than those in this table. New technologies could bring economic viability sooner.*
7. *Data from the Energy Information Administration, 2001 Residential Energy Consumption Survey indicate that households with an income of \$40,000 would, if the members did not change their patterns of consumption, receive rebates equal to their outlays in fees. Households in the income range \$15,000-\$20,000 would use only 86% of their rebates to pay their fees, while households with income more than \$75,000 would have fees 36% higher than the rebates they would receive.*

**Suggested starting fees on emissions**

The following table is adapted from the carbon tax in British Columbia, as published by the Victoria Transport Policy Institute. (This group also publishes “Raise my taxes, please!”). It is suggested as an emissions addition to the fossil-fuel fee on the energy value alone. This added fee would reward natural gas for having a low carbon content and penalize coal for being high in carbon. The penalties are, however, small.

FUEL	UNIT	MONTHS	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36
<b>CARBON</b>	tonnes		\$10	\$15	\$20	\$25	\$30
Gasoline	cents/gallon		9	13	18	22	26
Diesel	cents/gallon		10	15	20	25	30
Jet fuel	cents/gallon		10	15	20	25	30
Propane	cents/gallon		6	9	12	15	20
Natural gas	\$/500MJ		0.25	0.37	0.50	0.67	0.75
Coal - low heating value	\$/tonne		\$18	\$27	\$36	\$45	\$54
Coal - high heating value	\$/tonne		\$21	\$31	\$42	\$52	\$62

Other emission fees could be imposed on methane, especially on emissions from mines, landfills and from cattle and other livestock. It is a potent global-warming gas, and a fee would give encouragement to the managements to recover the methane and to put it to good use.

**A note on inequality**

Some people have objected to the favorable treatment of the poor in this policy. Since at least 1980 there has been overwhelmingly favorable treatment of the rich in the US (Bill Moyers “The rule of the rich”, Mother Jones, February 2011). Ben Bernanke has recently (December 2010) drawn attention to the extraordinary level of inequality that has been reached in the US and the need to correct it. Gross inequality in any society promotes instability and a general malaise that can reach the rich. A year or two after I proposed this policy in Sao Paulo and emphasized the need to give cash to the poor rather than services, the Brazilian government introduced Bolsa Familia, a small cash payment to 13-million families (it was probably a coincidence).

*The Economist* reports that “It has had a fairly dramatic effect on poverty and inequality. . . .” somewhat similar to welfare that would have a “massively higher cost”.

Additional data on the proposed policy can be found on the web-site [lessgovletsgo.org](http://lessgovletsgo.org)

*David Gordon (Dave) Wilson, emeritus professor of mechanical engineering, and colleagues*

*MIT: Room 3-256, 77 Mass. Ave, Cambridge 02139, Phone: 617 253 5121*

*Email: [dgwilson@mit.edu](mailto:dgwilson@mit.edu) Home address: 21 Winthrop Street, Winchester MA 01890; Phone 781 72*

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## Larry Gould — Editorial Comments plus other Contributions

*The “Global Warming”/“Climate Change” controversy continues —*

### **E-mail LETTER to the Editors from Gordon Fulks**

(received 14 September 2011)

Editors:

With more physicists engaging in the public debate over Anthropogenic Global Warming (AGW), we have the possibility of a much more informed discussion without the volumes of nonsense from those who have merely learned the jargon and lack scientific credentials. Global Warming from journalists and politicians has become a comedy routine with practically everything imaginable attributed to human emissions of carbon dioxide and the small amount of warming we know they cause (in the absence of all other effects). But those who practice science without an education are loathe to include any caveats and much prefer expressions like “unprecedented” or “worse than we thought” to describe any occurrence that they deem to be a deviation from “normal.” Of course on a fluid planet with vast oceans and atmosphere, deviations from normal are perfectly normal!

Two solutions come to mind to deal with the scientifically illiterate who promote hysteria. One is to play along with those such as Greenpeace activist Steven Guillebeault who explained so succinctly: “Global warming can mean colder. It can mean wetter. It can mean drier. That’s what we’re talking about.” For those more careful to avoid complete contradictions but still engage in vast nonsense, perhaps one should suggest that many professions require an education and a license to practice. To protect the public, it is typically illegal to practice medicine, law, or engineering without an appropriate education. Accomplishments in economics, for instance, qualify Nobel Laureate Paul Krugman to discuss the economics driving climate hysteria but certainly not the science that he prefers to hawk in the *New York Times*. Similarly, biologists and engineers can be on very thin ice claiming to be “climate scientists” just because they have observed a change in a species or in our environment. Those changes may have very little to do with climate, let alone warming, let alone carbon dioxide, let alone man-made carbon dioxide.

Then there are the physical scientists like chemist Andrew Dessler who wrote an Op-Ed recently that sounded like it came from a political partisan, not a real scientist trying to explain a complex subject to ordinary folks: <http://www.miamiherald.com/2011/08/29/2379980/shooting-the-messenger.html>

Remarkably, Dessler makes the most elementary mistake that a scientist can make about global warming: noting a heat wave in Texas and attributing it to humans. Yes, Texas was especially hot this summer, setting various records including the warmest summer (June, July, and

August) since records began. But its temperature trend for more than 100 years is virtually flat. Furthermore, we in the Pacific Northwest had much the opposite experience, the coldest spring (April, May, and June) in the temperature record. Putting the two together, one could easily argue for inadequate mixing of air masses, not global warming or cooling.

Moreover, Dessler anoints himself as as some sort of heavenly “messenger” warning the rest of us of “unchecked climate change.” That’s a bit melodramatic for a scientist who completely ignores the logic and evidence that sets science apart from another human pastime: telling tall tales.

Dessler is sure that he is correct because he has the support of his pals at various Texas universities. Does he really believe that we settle issues in science by taking an opinion poll of Texans? If someone asks why we think the earth is round, do we answer that 97 % of scientists in Texas agree it is, and the National Academy of Sciences has an official policy to that effect?

Many sensible things can be explained to a general public eager to learn something about how our climate works, without venturing into the technical reasons why climate models fail so miserably. When I write or speak, my opponent is ignorance as much as any promoter of an apocalypse. I prefer to explain that carbon dioxide is one of many effects that drive our climate and certainly of much less importance than the real climate gas, water vapor. Those of us who live in a dry summer climate realize that our nights cool down dramatically from daytime highs because of our low humidity. Carbon dioxide is unable to block nighttime radiative cooling as water vapor does in other areas.

Where does much of the climate drama play out? Not in our atmosphere but in our oceans. Most people are completely unaware that the vast majority of mobile heat on this planet is tied up in the oceans. Once they understand this, they begin to recognize the importance of El Ninos and other ocean oscillations.

Because some try to scare the public about a few watts/square meter of theoretical climate forcing from CO<sub>2</sub>, I like to ask what would happen if we could turn up incoming solar radiation by a whopping 75 watts/square meter? Would the planet fry immediately? Well, we do that experiment every January when the earth reaches closest approach to the Sun. Does the global temperature peak in January? No, it peaks in July when we are farthest from the Sun! WHY? The vast oceans in the Southern Hemisphere are very effective at absorbing the additional solar energy and dissipating it. Tropical regions in the mid-Pacific are so well regulated by the surrounding ocean that their historic lows and highs differ by only about 15 degrees Centigrade.

Of course, there are people today who prefer to hear scientists promote AGW because it fits their politics. They should be reminded of the Trofim Lysenko affair in the Soviet Union, where Joseph Stalin found Lysenko’s “scientific ideas” politically useful and did not care about the dreadful consequences. When Stalin was safely in his grave and Khrushchev out of the way, it was up to prominent physicists to speak up. In 1964, the celebrated Andrei Sakharov spoke against Lysenko in the Soviet Academy of Sciences:

*[H]e is responsible for the shameful backwardness of Soviet biology and of genetics in particular, for the dissemination of pseudo-scientific views, for adventurism, for the degradation of learning, and for the defamation, firing, arrest, even death, of many genuine scientists.*

Lysenko’s immunity from criticism soon ended, and the scam bearing his name rapidly collapsed.

The fundamental issue for physicists, then as now, is the integrity of science. Many thanks to Nobel Laureate Ivar Giaever for making this abundantly clear in his recent resignation from APS.

*Gordon J. Fulks, Ph.D. (Physics)  
Portland, Oregon USA*

*Editor's Notes. 1. The quotation can be found at <http://www.learnquestion.com/seevak/groups/2003/sites/sakharov/AS/biography/dissent.html> The quote in that link also mentions Sakharov's similar advising against the admission of Nikolai Nuzhdin — nominee of the biology department — to the Soviet Academy of Sciences. (Is there an analogous problem today? See, e.g., Richard S. Lindzen's article, "Climate Science: Is it currently designed to answer questions?") <http://icecap.us/images/uploads/ClimateScience-arXiveRSLindzenRev3a.pdf>  
2. Some details about Dr. Giaever's resignation from APS can be found on the internet.*

## **E-mail LETTER to the Editors from Roger Cohen**

(received 4 October 2011)

[The following letter pertains to the October 2011 issue of *Physics Today*]

The two latest global warming articles (*Physics Today* **64**, 10 (2011)) continue the consistently one-sided advocacy drumbeat that has characterized AIP publications and posture.

The Sherwood article first sets up a straw man of the opposition as nonbelievers in the "greenhouse effect." Then it assumes for itself the mantle of Copernican truth, ignoring the fact that skeptics have also claimed Copernicus as their own; after all, everything depends on just what you think is the errant Ptolemaic system. Worst of all, it puts down the fundamental quantitative scientific issue of the magnitude of anthropogenic change as a mere "slippery slope." Never mind that physics is a quantitative science. It continues with this falsehood: "every legitimate method for [calculating the magnitude] yields a significant magnitude. The key word here is "legitimate," which unilaterally dismisses the substantial body of published work, mostly empirical, standing in opposition to computer climate models. This work finds a relatively small anthropogenic contribution.

The Somerville/Hassol article explains that our problem is that we just need to communicate better to the great unwashed, this arrogance coming at a time when the public has lost confidence in the integrity of science and scientists:

[http://www.rasmussenreports.com/public\\_content/politics/current\\_events/environment\\_energy/69\\_say\\_it\\_s\\_likely\\_scientists\\_have\\_falsified\\_global\\_warming\\_research](http://www.rasmussenreports.com/public_content/politics/current_events/environment_energy/69_say_it_s_likely_scientists_have_falsified_global_warming_research)

*Roger W. Cohen, Fellow, American Physical Society*

## **Comments related to the LETTER by Fulks and by Cohen**

(a) It is most regrettable that Administrators of the AIP have continued to accede to the AGW alarmist claim, through, e.g., one of its member organizations (APS). This behavior has directly resulted in the resignations from the APS of two sterling physicists: Ivar Giaever (September 2011) and Hal Lewis (October 2010) — see, <http://climatephysics.com/2010/10/08/hal-lewis-my-resignation-from-the-american-physical-society/> which criticizes the APS Statement along with (in context) its sentence: "The evidence is incontrovertible: Global warming is occurring." But as Peter Parker (2011 Chair of the NES APS) cautions (in an email to me on 11/1/2011): "The APS statement does not claim that AGW

evidence in ‘incontrovertible’. It does say that the global temperature rise is incontrovertible but not AGW.” (Readers may judge for themselves as the full Statement can be found at [http://www.openletter-globalwarming.info/Site/2009\\_open\\_letter.html](http://www.openletter-globalwarming.info/Site/2009_open_letter.html) under the heading “The statement of the APS Council, adopted on November 18, 2007 is as follows:”)

For some history and issues about that claim, see the explanation (particularly the third-from-the-end paragraph that begins, “And there is the sleight of hand.”) with supporting links from the Email Letter to the Editors by Roger Cohen, in the Spring 2010 Newsletter <http://www.aps.org/units/nes/newsletters/spring10.cfm>

The climatephysics.com link (above) also includes a letter from Gordon Fulks in support of Hal Lewis’s argument explaining the importance of integrity in science. (I should add that although I admire the arguments given by Drs. Gjaever and Lewis, I think it might be more effective for others to try to effect change by remaining within the APS.)

(b) Economics issues: There is a misunderstanding about a variety of economic impacts from AGW policies. Recommended reading to clarify some of the issues from a cost/benefit point of view is the paper titled “The Myth of Green Jobs” by Gordon Hughes [http://thegwpcf.org/images/stories/gwpcf-reports/hughes-green\\_jobs.pdf](http://thegwpcf.org/images/stories/gwpcf-reports/hughes-green_jobs.pdf)

(c) Science vs Anti-Science issues: The major news media tends to focus on the AGW alarmist side bolstered by research papers, books, and conferences. However, there are also many research papers, books, and conferences which present a side criticizing that of the alarmists. See, e.g., recent videos from the “Sixth International Conference on Climate Change: Restoring the Scientific Method” <http://climateconference.heartland.org/past-conferences/iccc-6/> The general issue is whether or not a valid scientific methodology pertaining to AGW will be followed.

Scientific methodology relies heavily on evidence and reasoning. The great technical advances of civilization stem from such methodology. Yet there have been (and continue to be) anti-science attacks on science. An excellent analysis of such attacks can be seen in the book *Science and Anti-Science* by Gerald Holton (Harvard University Press, 1993). Although his book contains criticism of the anti-science “creationism” movement a number of Holton’s remarks apply equally well to those who are anti-science in the “environmentalism” movement. The following are selections from those remarks:

*the intellectual agenda of the current ... movement has been propelled chiefly by a ... dedicated group trained in science and engineering, many with doctorates and research positions and capable of living with glaring contradictions within their total world picture. ... They are well financed and well organized, highly productive of eloquent publications in their own journals, books, films, radio and TV programs, and educational institutes. (p. 182)*

The book ends with a warning:

*it is prudent to regard the committed and ... ambitious parts of the anti-science phenomenon as a reminder of the Beast that slumbers below. When it awakens, as it has again and again over the past few centuries... it will make its true power known. (p. 184)*

The purpose of any scientific society is to *promote science*. By so doing the “Beast” is more likely to remain asleep.

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