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PUBLISHER

Randolph A. Nanna
Tel: 301-209-3102
rnanna@aip.org

ASSOCIATE PUBLISHER/EDITOR

Kenneth J. McNaughton
Tel: 301-209-3051
kmcnaugh@aip.org

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One Physics Ellipse
College Park, MD 20740-3842
Tel: 301-209-3051
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LETTERS

Global warming

Your recent article "Millennia of global warming" (June/July, p. 13) states that it is an anomaly that solar radiation levels decline while temperature rises, alleging further a correlation of CO₂ levels and temperature over geological time periods. Both are flatly wrong.

Changes in the carbon dioxide level over millions of years do not correlate with temperature increases, even though CO₂ levels in the past have been 20 times as high as today's. "On the time scale of hundreds of millions of years, carbon dioxide has sharply declined; its concentration was as much as 20 times the present value at the beginning of the Cambrian Period, 600 million years ago (Berner, 1997). Yet the climate has not varied all that much, and glaciations have occurred throughout geologic time even when CO₂ concentrations were high" [1].

Only recently has it been possible to obtain sufficient resolution to demonstrate that the increase in CO₂ lags about 600 years behind the rapid warming that signals deglaciation, the end of an ice age [2]. Citing Fischer's study [2], *CO₂ Science* magazine (http://www.co2science.org/edit/v2_edit/v2n7edit.htm) noted: "Over this immense time span, the three most dramatic warming events experienced on Earth were those associated with the terminations of the last three ice ages; and for each and every one of these tremendous global warmings, Earth's air temperature rose well before there was any increase in atmospheric CO₂. In fact, the air's CO₂ content did not begin to rise until 400 to 1,000 years after the planet began to warm" [3].

In summary, "Major past climate changes either were uncorrelated with changes in CO₂ or were characterized by temperature changes that preceded changes in CO₂ by hundreds to thousands of years" [4]. You should be looking beyond the "pop culture" on global warming into the real science.

Randy M. Mott

Ekotechnology

Warszawa, Poland

randymott@ekotechnology.com

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1. Singer, S. F., Human Contribution to Climate Change Remains Questionable. *EOS Trans.* 1999, 80, 183-187.

2. Fischer et al. found that "the time lag of the rise in CO₂ concentrations with respect to temperature change is on the order of 400 to 1,000 years during all three glacial-interglacial transitions." Fischer, H.; Wahlen, M.; Smith, J.; Mastroianni, D.; and Deck, B. Ice core records of atmospheric CO₂ around the last three glacial terminations. *Science* 1999, 283, 1712-1714.

3. "Changes in CO₂ concentration cannot be claimed to be the cause of changes in air temperature, for the appropriate sequence of events (temperature change following CO₂ change) is not only never present, it is actually violated in [at least] half of the record." Idso, S. B. Carbon dioxide and climate in the Vostok ice core. *Atmospheric Environment* 1988, 22, 2341-2342.

4. Testimony of Richard S. Lindzen, Massachusetts Institute of Technology, former chairman of the National Academy of Sciences Climate Change Panel, before the Sen-



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Letters

ate Environment and Public Works Committee on May 2, 2001.

I was interested to read "Millennia of global warming" by Eric Lerner. While we may blame humans for "global warming," nature itself has provided a much greater source of greenhouse gases in the form of "burning ice" (methane hydrates) that have outgassed into the atmosphere periodically in the geological past. I have listed some Web sites that describe the characteristics of and issues regarding the Earth's burning ice and the natural abundance of methane greenhouse gases.

The issue of "global warming" brings up the need for good mathematics to analyze the various data sources to determine true causes and effects ("inputs" and "outputs") and to filter out those causes that either do not affect the output, affect it in minor ways, or create combined effects that do not show up until certain conditions are achieved. I have found that not many scientists and researchers know how to use statistics properly to be able to filter and view data for true causes and effects. Too often, statistical regression methods are used that assume a direct relationship between causes and effects that may not be real. Although several books are on the market, one of the best books I know, which can help researchers, analysts, and scientists, is *Statistics for Experimenters*, by G. E. P. Box, W. G. Hunter, and J. S. Hunter.

When it comes to global warming, there are more causes than most scientists have considered. For example, the increase in the number and intensity of solar eruptions has a much higher statistical correlation than the other causes (inputs). There are not many Web pages that show these causes well, but here are two: <http://www.qualitydigest.com/mar98/html/spctool.html>, and <http://www.qualitydigest.com/april98/html/spctool.html>.

Some researchers say they know all the effects that the increased solar flux has on the atmosphere and have included them in their models, but other scientists with different theories on the effects of increased flux present different scenarios for atmo-

spheric reactions, such as changes in geomagnetic fields. Scientists should be very cautious about assuming that the global warming "effect" is due solely to "greenhouse" gases. Some researchers say that their theories and models show that cooling should occur, while others show different effects. There is still not complete agreement on the causes, and especially the effects, of global warming.

In addition, the issue of temperature measurement has not been properly resolved. Temperatures are taken in cities that demonstrate the heat island effect. I have seen several different approaches to handling and correcting these heat effects, but the approaches vary and also give different results. Then there is the issue of thermometer calibration. I have observed that some thermometers for city temperatures were not calibrated properly at the required intervals, and sometimes not calibrated at all. How can we trust the temperature data if there are such variations in the instruments?

When it comes to nature's greenhouse generators, we soon realize that the contribution of other gases is very small compared with the megatons of methane hydrates held within our oceans in a manner similar to a bathtub ring. In addition, the Earth has had major accumulations and releases in its geological past, some of which scientists now believe may have led to great temperature increases long before humans were around.

It is not wise to base international policies on theories that are not agreed upon by the scientists who have been studying these causes and effects. Other scientists have published works dealing with other causes, but they have not received the same sort of publicity as the U.S. National Center for Atmospheric Research has received.

Catherine French
Los Alamos, New Mexico
faxcntn@gte.net

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<http://www.at-sea.org/missions/extremes/preview.html>

- <http://www.gomr.mms.gov/homepg/regulate/environ/chemo/chemo.html>
- <http://www.ocean.tamu.edu/Quarterdeck/QD5.3/sassen.html>
- http://www.mbari.org/ghgases/geochem/gas_hydrates.htm
- <http://ench1.ench.ualgary.ca/~hydrates/>
- <http://fossil.energy.gov/programs/oilgas/hydrates/>
2. U.S. Geological Survey (U.S.G.S.):
<http://walrus.wr.usgs.gov/hydrates/>
- <http://marine.usgs.gov/fact-sheets/gas-hydrates/title.html>
- <http://pubs.usgs.gov/fs/fs021-01/>
- <http://woodshole.er.usgs.gov/project-pages/hydrates/>
3. German research:
<http://www.mpi-bremen.de/deutsch/biogeo/mumm2.html>
- <http://www.gashydrate.de/>

Spin-off

In the article "Spin and energy—free?" (August/September 2003, p. 8), Eric J. Lerner described the claims of A. O. Wistrom and V. M. Khachatourian, who said that they had theoretically proved that three charged conducting spheres would start spinning: Lerner reported, "Most physicists would not expect startling new theoretical conclusions to emerge from electrostatics, whose basic mathematical structure was completed 150 years ago. Yet two researchers at the University of California, Riverside, arrived at conclusions that, if true, would be revolutionary. In a forthcoming paper (*J. Physics A: Math. Gen.* 2003, 36, 6495), Anders O. Wistrom and V. M. Khachatourian say they have proven mathematically that electrostatic forces among three charged, perfectly conducting spheres will cause them to start spinning. This conclusion, which the authors have derived from Coulomb's law, contradicts long-held assumptions about how electrical fields behave. Equally striking, it implies that, in theory, an arrangement of three such spheres could transfer unlimited amounts of energy into the spinning spheres—a violation of conservation of energy. Such remarkable claims would be dismissed quickly as perpetual motion if reviewers for the *Journal of*

Physics had not carefully checked the work.”

I believe it is in the interest of the readers of *The Industrial Physicist* to know that the *Journal of Physics A: Math. Gen.* recently published my Comment (M. Horoi, *J. Physics A: Math. Gen.* 2004, 37, 6407) showing that the claims of Khachatourian and Wistrom in *J. Physics A: Math. Gen.* 2003, 36, 6495 (including their errata on page 8539 of vol. 36) are incorrect. Given the strong emphasis in Lerner’s piece on the role of the reviewers of the *Journal of Physics A* in backing up what he calls “such remarkable claims,” I should add that according to my correspondence with the Editors of the *Journal of Physics A*, the referees of the original paper had the chance to review the Comment, but they declined to answer the critique.

Mihai Horoi
Physics Department,
Central Michigan University
Mount Pleasant, Michigan
horoi@phy.cmich.edu

Hydrogen overflow

Why does it seem that no one mentions the hydrogen fuel cell being developed by Blacklight Power, Inc. (<http://blacklightpower.com/>)? The company claims it will produce electricity for far less than the cost of coal and that a small unit could power a car with onboard generation of hydrogen.

Fred Peschel
Peschel Instruments, Inc.
Cape Coral, Florida
pii@cyberstreet.com

John Tate claims in his letter of June/July (pp. 6–8) that when compressed hydrogen is expanded for use in a fuel cell, it will get very cold. Actually, hydrogen gets warmer when it undergoes throttled expansion, because of its negative Joule–Thompson coefficient. The amount of warming is only a few degrees.

Robert Erck
Argonne National Laboratory
Argonne, Illinois

I read the various letters about the hydrogen economy and the serious prob-

lems that are ahead if it is to progress (April/May, page 4, and June/July, p. 4). I wonder if anyone has calculated or investigated the old technology for producing hydrogen—the Kipp generator, which uses an acid–metal reaction to generate hydrogen on demand. I have no idea of the quantity of hydrogen required by a fuel cell to power a practical people mover.

Carl G. Cash
Simpson, Gumpertz, & Heger, Inc.
Waltham, Massachusetts

One of the ways to store hydrogen is as a liquid, which is very cold. When the gas is burned, it creates heat, and there is a large temperature differential. This makes me think of the Carnot cycle, in which a large temperature differential means high efficiency. Heat engines such as the Stirling engine can use the low temperature of the liquid hydrogen to reject heat from the cold side of the engine. A Stirling engine typically has to reject twice as much heat as an internal combustion engine of the same size, which means a large radiator. Producing hydrogen is still the biggest hurdle to our future energy needs, and I think a new generation of nuclear reactors is the only viable solution.

Paul Overmyer
Sunnyvale, California

Correction

In the June/July issue on page 10, “Superlenses,” the caption should read: “Two antennas separated by only 1/6 of a wavelength of emitted microwave radiation (a) do not produce images (b), but when focused by a left-handed material that includes an array of wires (c), they do (d).” In the final paragraph, the first sentence should read, “However, Lagarkov and Kissel believe that...,” and the last sentence should end “... Kissel says.”

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