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# LaRouche On Woese

# Yes, We Can Reprocess Nuclear Fuel!

# 21st CENTURY SCIENCE & TECHNOLOGY

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## Features



NASA

*A typical site for Archaea, the new kingdom discovered by microbiologist Carl Woese (p. 21).*

## Departments



ON THE COVER: Nuclear reactor fuel assembly unit: Once used, nuclear fuel can be recycled and used again—truly renewable! Photo courtesy of Nuclear Regulatory Commission; cover design by Alan Yue.

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# Life, Life, Life . . .

A report on gamma ray photosynthesis from University of Missouri Emeritus Professor T.D. Luckey raises afresh the crucial question of the relationship among the three ontological domains of living, non-living, and noetic, first clearly identified by Academician V.I. Vernadsky in the early decades of the 20th Century.

Dr. Luckey's communication, to appear in full in our Fall issue, reports on experiments exposing a *Pseudomonas* bacterium and *Anacystis* alga to continuous gamma rays from a cobalt-60 source at the University of Missouri Research Reactor. In the absence of any visible light, both organisms remained green and increased in mass, up to a limit, in proportion to the radiation flux.

The exact mechanism by which gamma rays, orders of magnitude more energetic than visible light photons, might trigger a photosynthetic reaction is not known. As Dr. Luckey notes, low-energy gamma rays can transfer energy to an atomic electron, either by the photoelectric or the Compton effect, in the process producing a photon of visible light. Whatever the means which Nature has chosen to accomplish this feat, the results suggest that radiation from decay of natural radioactive elements in the Earth's crust may play a role in encouraging the growth of subsurface microorganisms, which we now know make up the vast bulk of living matter on the Earth. One can only speculate on the possibilities for the development of life in the radiation-rich environment of an early planet.

### The Tyranny of Reductionism

However, it is not the attempt to adduce a credible mechanism, but rather the understanding of the process within the whole of universal creation, which must guide us in the search. And it is here, that a break with currently accepted modes of intellectual behavior is most urgently required. As our feature on the work of Carl Woese, et al. indicates, the tyranny of reductionism, a self-imposed mental enslavement, but one which is enforced by raw power, must end. So, too, must the insistence that physical science be restricted to the rules imposed by the cult of entropy.

The resolution of the impasse which has engulfed physics since the 1927 Solvay Conference requires a real revolution in science, a rebirth of a universal view of man and nature of a sort which modern empiricism claims is impossible. That means that physics must recognize its subsidiary role within the scheme of human knowledge as a whole. The actual ordering of human knowledge, which, when understood, has always led to true and revolutionary advance in science, has always been the same: First the immortal soul (human creativity), then living processes, then the non-living. Presently neither the so-called "life sciences," nor the "physical sciences" have got it right.

Photosynthesis, the conversion of solar, and perhaps even cosmic, radiation into living tissue, is an obvious candidate for study. One of the first applications of analysis by radioactive isotopes was to the study of photosynthesis in the period immediately preceding World War II. A process that had, until then, been represented by a single chemical equation turned out to be one of extreme complexity; even the apparently obvious assumption of the conversion of carbon dioxide into oxygen proved wrong in detail, as it turned out that there was first an exchange of the oxygen in the carbon dioxide with that in water.

Yet, even after decades of study it can hardly be said that the book is closed on the subject, as the Luckey study, among others, shows. LaRouche's entry in this issue on "The Subject of Principle: 'Project Genesis'" should clarify some fundamental issues of method which will help to set matters such as these straight.

*—Laurence Hecht*

# Nuclear Decay Rates and the Cosmos

*by Zbigniew Jaworowski*

A paper by J.H. Jenkins et al. on "Evidence for Correlation Between Nuclear Decay Rates and Earth-Sun Distance," dated Aug. 25, 2008, was circulated on CCNet, Aug. 28.[1] The same phenomenon was described in 1998 by S.E. Shnoll et al. from Lomonosov Moscow State University (shnoll@iteb.ru) in a paper titled "Realization of Discrete States During Fluctuations in Macroscopic Processes," published in English in *Physics-Uspekhi,*[2] It was also reviewed in *21st Century,* Summer 2000 (www.21stcenturysciencetech.com/articles/ time.html)

The abstract of the Shnoll paper reads: "It is shown that due to fluctuations, a sequence of discrete values is generated by successive measurement events whatever the type of the process measured. The corresponding histograms have much the same shape at any given time and for processes of different nature and are very likely to change shape simultaneously for various processes and in widely distant laboratories. For a series of successive histograms, any given one is highly probably similar to its nearest neighbors and occurs repeatedly with a period of 24 hours, 27 days, and about 365 days, thus implying that the phenomenon has a very profound cosmological (or cosmogonic) origin."

This paper is an effect of more than 40 years of studies, and parts of it were published several times before, after the first observation in 1955 of this phenomenon in various biochemical reactions. The paper cites 14 publications on this subject in Russian, the first in 1958. Later the phenomenon was found in homogenous chemical reactions with low-molecular compounds, as well as in diverse physico-chemical measurements: (a) velocities of latex particles in an electric field; (b) discharge time delay in neon lamp RC oscillator; (c) transverse relaxation time tau[2] of water protons using the spin echo technique; (d) amplitude of concentration fluctuations in the Belousov-Zhabotinsky reaction; and (e) radioactive decay of various isotopes.

It was found that the phenomenon does not depend on the measurement techniques or the nature of the phenomena under investigation. The measurements of radioactivity, for example, were performed with Geiger counters, liquid and solid scintillation counters, and solid state detectors. The beta, alpha and gamma activity of 11 radionuclides was measured: H-3, C-14, P-32, Co-60, Tl-204, Ra-226, Po-210, Po-214, Po-218, Pu-239, and the secondary X-ray quanta at 5.9 keV and 6.3 keV, which accompany the K-capture associated with the Fe-55 to Mn-55 transformation.

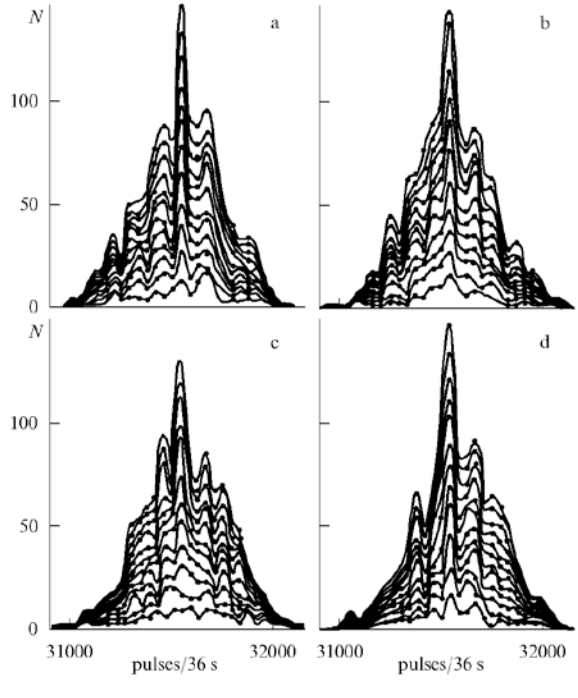
The bulk of the experimental data, however, were derived from the measurements of the alpha activity of Pu-239 specimens firmly attached to silicon solid state detectors. Control measurements were performed as necessary for eliminating the dependence of the results on the amplitude cut-off regime, etc.

The geographical distribution of the simultaneous measurements was rather large; the minimum distance between a pair of laboratories was more than one hundred and up to many thousands of kilometers. The study sites were at Moscow,

**Figure 1**
**ILLUSTRATION OF NON-RANDOMNESS OF THE DISTRIBUTION OF MEASUREMENTS OF RADIOACTIVITY**

*Results of 1,200 consecutive measurements of an Fe-55 preparation show the non-randomness of the radioactivity. Layer lines are drawn after each 100 measurements. Instead of the expected bell-shaped curve, sharp peaks are found at certain pulse rates of the scintillation counter. The mean activity is about 31,500 pulses per second, but peaks are seen at other activity levels in the four separate trials of 1,200 consecutive measurements shown here.*

Source: Courtesy of Shnoll et al., 1998. *Upsekhi Fisicheskikh Nauk,* Vol. 41, No. 10.



Pushchino, Tomsk, Leningrad, the Pacific Ocean, the Indian Ocean, and the White Sea beyond the Arctic Circle.

Shnoll et al. summarized their results as follows:

"Because of fluctuations, any sequence of measurements of processes of arbitrary nature yields a series of discrete values. Some of such values occur much more often than others—we observe 'allowed' and 'forbidden' states of microscopic objects. The corresponding histograms exhibit extrema—peaks and troughs. The shape of the spectrum of allowed and forbidden states—the relative distances between the levels and their populations—is at all times similar for processes of different natures, and is very likely to vary synchronously for different processes, even when they occur in laboratories many miles away from each other. There is a certain 'lifetime'; for the given shape of histograms: in series of consecutive histograms, a histogram is most likely to be similar to its closest neighbors. The shapes of histograms are very likely to recur with a period of 24 hours, 27 days, and 365 days. All this (regular time variation of consecutive histograms, similarity of histograms for simultaneous independent measurements of processes of different nature and possibly occurring at different geographical points) points to existence of a universal cosmophysical (cosmogonic) cause of this phenomenon."

In their conclusions, the Russian authors (six of them) analyzed a question: Why have there been no results from other laboratories?"

The Jenkins et al. paper is probably the first paper from such an "other laboratory."

One may find other English papers by Shnoll et al. at http://www.allais.info/priorartdocs/shnoll.htm

**References**


1. The Cambridge Conference Network, CCNet, is an electronic interest group moderated by Dr. Benny Peiser.
2. *Uspekhi Fizicheskikh Nauk*, Vol. 41, No. 10, pp. 1025-1035, 1998, Russian Academy of Sciences, (PACS numbers: 01.90.+g,06.20.+f, 89.90.+n).


VIEWPOINT

# Science: The Slide Toward Decadence

*by T.E. Phipps, Jr.*

There can be little doubt that the last fifty years have seen a steady slide toward decadence of the hard sciences. The quality of ideas, the capacity to judge beauty, the status accorded to empirical fact vs. theory, even elemental ethical standards, have slipped intolerably to the point where another fifty years of the same should write finis to science as a serious human enterprise (of value beyond entertainment). Readers of this magazine will need no further proof of such a drastic claim than a reminder of the history of the cold fusion fiasco. For it was indeed a fiasco for the physics Establishment, which revealed by its puerile rush to judgment precisely what its judgment was worth.

We now have scientific journal editors so stuck on themselves that they dare to reject papers—particularly submissions from home addresses—on their own initiative, without the formality of refereeing. And we have emperors of the Internet (located at Cornell) who automatically reject all arXiv.org submissions unless vouched for passionately by people with academic return addresses. So, now it is officially out in the open, real science is the Cosa Nostra of academia … all others need to apply (given such presumption) on their knees.

Thus it is tacitly acknowledged that the graduate-level science education given to other than academia's own is worthless without additional academic endorsement. With blanket criteria like that in action, you can see without much study where things have got to and where they will go. There is even said to be blacklisting by journal editors, that is, singling out of individual would-be contributors by name for automatic rejection. Why not? Its a logical conclusion. If not today, then tomorrow for sure. Do the academic lovers of freedom raise irate voices in the sort of protest they have shown themselves so good at? Bless you, child, let us be academically precise: The freedom they love is academic freedom—that is, freedom for themselves.

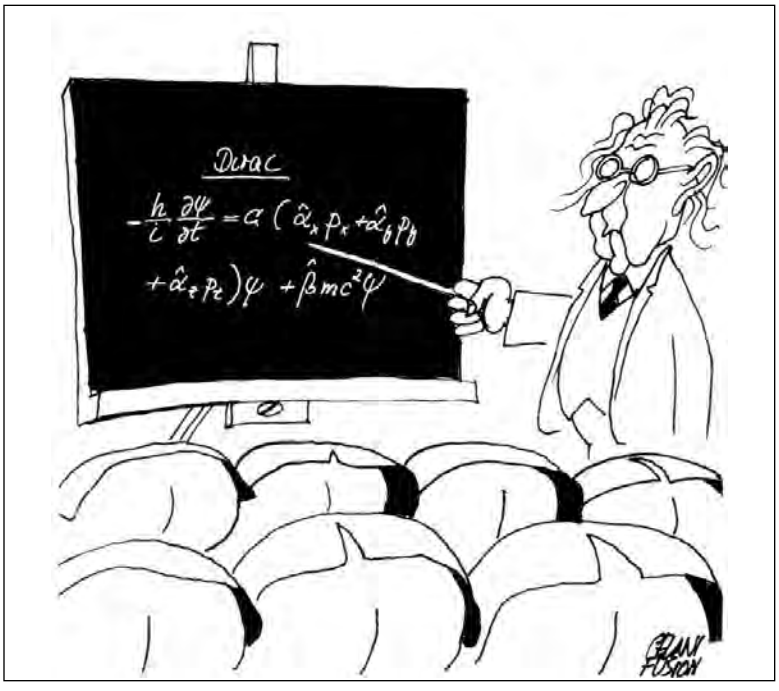
The same academic scientists who bemoan the public's lack of interest in science profoundly discourage such interest by repelling all contributions from the general public, other than their tax money in the form of grants. That, and the right of awe-stricken admiration, constitute the shrunken residue of non-academic freedoms granted to the unanointed, be they scientists or laypersons.

### The Crash of the Merit System

So much for the merit system, which has quietly crashed in flames. In my youth, when I went to graduate school, I was encouraged to cherish the illusion that scientific merit would prevail. So, I thought I did not need to join the academic crowd nor curry favor with it. All I had to do was to do good science.

Experience has taught me better. The system has evolved during my lifetime in so many ways to prevent merit from prevailing, that I can only marvel at my former state of mind. Yet I suspect that that state is still inculcated in each generation of youth by the solemn hypocrites of academia, including those on the math faculties, as well as physics, astronomy, etc. Some have wondered how Einstein, the lowly patent clerk, would make out today. I wonder the same about Ramanujan.

Dissidents face two levels of difficul-




ty in getting across new ideas. The first is the basic one of initial communication, that is, of making their ideas available for public consumption and judgment. This means getting past editorial censorship—there is no reason to call it anything else. The best ideas, I am convinced, never make it. This is because they necessarily possess certain features that make them unacceptable, beginning with their rejection of some accepted shibboleth. That nowadays is enough to stop a paper right at the editor's desk.

Supposing, however, by some freak of inattention the editor allows referees to see the paper, and supposing the referees have heard something good about someone with a name similar to that of the author, or are too busy to pick up on his heresy, then the paper may actually be published.

Now it faces the real difficulty. Either nobody reads it (reading being essentially a lost art) or those few who do read it react exactly as they would have done if asked to referee the paper: they stumble at the rejection of the shibboleth, or whatever made the paper unique and a contribution. For, truth to tell, most people, even (or particularly) those with doctorates, are not geniuses, nor equipped to recognize either genius or rightness, unless their colleagues are pressing it on them. So, there is a herd endorsement, a critical mass of approval, of any worthwhile new idea that constitutes an essential prerequisite for genuine progress, and is virtually impossible to attain under the conditions I have sketched.

In fact, the only kind of progress at all practically likely to occur is the sort offered historically by string theory: Some great Pooh-Bah (to wit, Ed Witten), laden with honors and already much admired in the profession, heads a school of sycophants who automatically provide the critical mass of "consensus" needed to ensure that any rotten idea is perceived as beautiful. Editors self-effacingly bow down. Science marches on, crushing all untruths beneath its vengeful heel. Alternatives devolve inexorably from dubious to career-poisoning.

This seems to be the story behind most of the media-trumpeted physics advances of the last half-century, beginning with the Big Bang and unlikely to stop anywhere short of the ludicrous, if there. Whom the Gods would laugh at, they first make theoretical physicists, or what has become the same thing, mathematicians manqués.

J.M. Herndon, writing in *Against the Tide: A Critical Review by Scientists of How Physics & Astronomy Get Done* (Bocal Raton, Fla.: Universal Publishers, 2008), attributes the corruption of the current journal refereeing system to the anonymity of the process. That seems to me both an under-estimation and an over-simplification, but worth considering. The only downside to openly naming referees is that a tiny handful of truly nutty contributors are by nature litigious. Despite Constitutional Amendments, the grim shadow of the law dampens all genuine free speech in the home of the brave and the land of the advertisedly free. I should like to make the case against all tort law, but not here.

Is there any hope of reversing the trend of decadence in theoretical science? I opine that there is only one force in the universe strong enough to accomplish this. That is the force of disgust. If enough academicians become sufficiently disgusted with what they have done, the conditions needed for progress in science may recur on Earth. Until then, it will be string theories all the way down.

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*Dr. Phipps, a retired physicist, is on the Scientific Advisory Board of* 21st Century. *Among his many articles are "Simulation of Ampèrian Current Elements by Magnetic Toroids," (*21st Century*, Summer 1998). After retiring from research in civilian and military organizations in 1980, Phipps set up a small physics laboratory in his father's basement, where they conducted joint experiments until his father's death in 1990. These experiments are described in* Heretical Verities*, published in 1987. His most recent book is* Old Physics for New*, published by Apeiron Press in 2006.*

*Phipps can be reached at tephipps@sbcglobal.net*


*This video-grab from Chinese television shows Shenzhou VII mission commander Zhai on his EVA. Videos of China's first spacewalk can be viewed at www.cctv.com/english/special/Shenzhou7/02/04/index.shtml.*

**CHINA'S FIRST SPACE WALK IS PICTURE PERFECT**

On Sept. 27, at 4:43 Beijing time, Shenzhou VII mission commander Zhai Zhigang exited the orbital module of his spacecraft and successfully conducted a nearly 25-minute extravehicular activity, or space walk. The live television footage of the EVA was stunning, showing Zhai up-close in his white space suit against the blackness of space. He retrieved a sample of solid lubricant material from outside the spacecraft, which Chinese scientists will examine for the effects of its exposure to space.

Indicative of the caution with which the Chinese manned space program is carried out, Zhai wore the Chinese-made Feitian space suit, estimated to have cost $4 million to develop. A second astronaut, Liu Boming, donned a Russian-made Sokol suit, which has been used for many years, in case Zhai encountered any problems. Liu briefly exited the Shenzhou. The space walk went smoothly, and afterward Zhai spoke with President Hu Jintao, who had watched the activity live from Mission Control.

Before launch, NASA public affairs told *Xinhua* that the U.S. space agency wished China success and the safe return of its crew.

**FDA OKAYS IRRADIATION TO KILL PATHOGENS IN LETTUCE AND SPINACH**

The Food and Drug Administration announced a final rule Aug. 21 allowing the use of ionizing radiation to control food-borne pathogens in fresh iceberg lettuce and fresh spinach. This means that consumers can now choose to buy lettuce and spinach that are guaranteed to be *E. coli* free. Previous FDA regulations have allowed lettuce, spinach, and other fresh produce to be irradiated to kill insects or to slow spoilage. But the doses necessary to kill most disease-causing bacteria are slightly higher and required a new ruling.

More widespread use of food irradiation in the developing sector could increase the food supply, by protecting harvested food crops from insects, rodents, fungi, and harmful pathogens. Now, 25-50 percent or more of food is lost to spoilage, especially in places where food storage infrastructure is lacking. But the technology has been held back by the food cartels which want to use it only as it suits their sales strategy.

For more on food irradiation, see article, p. 42.


Petten High Flux Reactor/NRG

*A shielded bottle containing molybdenum-99. Mo-99, with a half-life of 66 hours, decays into technetium-99, which has a half-life of 6 hours. Hospitals store the Mo-99 and separate out the Tc-99m, which is the most widely used isotope for medical diagnostics.*

**NEW ISOTOPE PRODUCTION SYSTEM CAN ASSURE DOMESTIC SUPPLIES**

The Washington-based company Advanced Medical Isotopes Corp (AMIC) is partnering with the University of Missouri at Columbia to develop an innovative method of producing molybdenum-99, without a nuclear reactor. The University holds patents on a sub-critical system it created for fissioning U-235 into such products as Mo-99. Energetic gamma rays are directed into a tank of heavy water, producing neutrons, which then bombard the uranium nuclei with energies similar to those in nuclear reactors. Using targets other than uranium, other isotopes can be produced.

According to Robert Schenter, chief science officer of AMIC, the apparatus is room-size, and would allow such systems to be located in major cities, producing short-lived isotopes close to the point of use.

Mo-99 is used to generate technetium-99m, the very short-lived isotope used for more than 80 percent of radioisotope diagnostic procedures globally. The United States now imports 90 percent of its medical isotopes, mostly from Canada. Recent shortages caused by the shutdown of supplier reactors in Canada, Europe, and South Africa, forced the postponement of diagnostic and treatment procedures here and in other countries.

AMIC estimates that production could begin in about three years, and it expects to have a prototype built next year for testing and development of isotope extraction procedures.

**NUCLEAR TRANSMUTATION A FOCUS AT COLD FUSION CONFERENCE**

Despite catcalls and nose-thumbing from a largely brain-dead scientific establishment, a determined group of scientists has kept up the research on the anomalous production of heat and nuclear by-products, first observed by Drs. Fleischmann and Pons in a palladium cathode electrolytic cell, and reported at a March 23, 1989 press conference in Salt Lake City, Utah. The latest results of this ongoing scientific work were presented by researchers from four continents at ICCF-14, the 14th International Conference on Condensed Matter Nuclear Science, held in Washington, D.C. Aug. 10-14.

After initial attempts to verify the anomalous results of Pons-Fleischmann as a D-D (deuterium fusion) reaction, some researchers turned to the hypothesis that some new form of nuclear process was occurring. Beginning in the mid-1990s, reports began to come in of new elements from lithium to lead appearing on the surface, and also of a change in the isotopic composition of the palladium electrode, after operation of the cell. This and other evidence suggesting that nuclear reactions of a previously unknown type are occurring, has become a focus of many researchers in their attempt to pin down what new science is occurring here. Suggestions of a new type of fission, possibly of the palladium nucleus have been entertained, among other possibilities.

New evidence suggesting the appearance of a nuclear reaction in organic materials including cross-linked polyethylene (XLPE) sheets exposed to high currents and in the organic molecule phenanthrene, was also presented at the conference.

Abstracts of the conference presentations can be found at http://lenr-canr.org/Collections/ICCF14Abstracts.pdf. News of the subject and access to electronic copies of hundreds of scientific papers on the topic are to be found at http://lenr-canr.org/ .

Marjorie Mazel Hecht

*Japanese scientist Yoshiaki Arata, Emeritus Professor at Osaka University, was honored at the ICCF-14 conference with an award and a conference session discussing his achievements.*

**NUCLEAR NEAR BOTTOM OF LIST FOR FEDERAL SUBSIDIES**

A new report on Federal incentives for energy development shows that the main beneficiaries of the more than $700 billion of government energy incentives over the past five decades have been the oil and natural gas industries. Together, these two industries have received 60 percent of Federal incentives between 1950 and 2006, with about 46 percent going to the oil sector. The study was carried out by Management Information Services, Inc.

The study also shows that of the total incentives provided since 1950, coal has received 13 percent ($94 billion), hydroelectric energy sources, have received 11 percent ($80 billion), nuclear energy has received 9 percent ($65 billion), and renewable energy has received 6 percent ($45 billion). The report also indicates that since 1988, Federal spending on nuclear energy R&D has been less than spending on coal research and, since 1994, has been less than spending on renewable energy research.

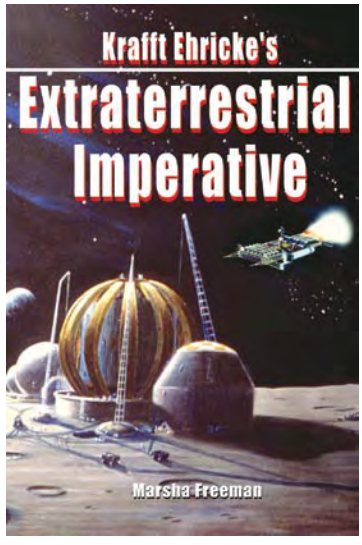
The report can be read in pdf format at www.nei.org.

**NEW BIOGRAPHY OF SPACE VISIONARY KRAFFT EHRICKE TO BE RELEASED**

The philosophical and technical contributions of German-American space visionary Krafft Ehricke, are the focus of the first biography ever written about this space pioneer. *Krafft Ehricke's Extraterrestrial Imperative*, written by *21st Century Science & Technology* Associate Editor Marsha Freeman, includes reprints of 20 of Ehricke's most important contributions to the field of astronautics. Published by Apogee Books, the book will be available in February 2009.

For ordering information, see www.apogeebooks.com later this year.

A few of Krafft Ehricke's writings are available in photocopy format from *21st Century*, https://www.21stcenturysciencetech.com/Merchant2/merchant.mv?Screen=CTGY&Store_Code=TTS&Category_Code=EHRK




*Marsha Freeman's biography of Krafft Ehricke will be available in February 2009.*

*compiled by Gregory Murphy*

## 'The Climate Made Me Do It'?

A group of Greenpeace protesters known as the Kingsnorth Six were arrested in 2007 for trying to paint "Gordon Bin It" (referring to Prime Minister Gordon Brown), on the Kingsnorth coal plant smokestack, which resulted in £30,000 in damages. During their trial, the Greenpeace protesters admitted that they did it, and never questioned the amount of damage. So, the matter might seem settled.

But no, the Kingsnorth Six claimed they were not liable for the damages, based on the law that holds a fireman not liable for damages when, in the process of trying to save lives, he breaks down the front door of a home to gain access. The Kingsnorth Six claimed, like the rescuing fireman, that they were saving the world from the effects of global warming, by protesting new coal plants!

In other words, these Greenpeace protesters took their defense from the 1960s-1970s comedian Flip Wilson, who was famous for his routine, "the devil made me do it." Now Greenpeace is saying, "the climate made me do it."

### Enter James Hansen

How did the jury buy this defense? The Kingsnorth Six called in James Hansen, the chief U.S. global warming alarmist, to testify as an expert witness. This means that his statements were made not as a private citizen, but as the director of NASA's Goddard Institute for Space Studies. Hansen claimed in his testimony that coal plants were the biggest cause of global warming. Further, Hansen told the court, "Maybe we have the wrong people on trial."

On Sept. 10, 2008, the jury in the Kingsnorth Six case, influenced by the Hansen testimony, found the Greenpeacers "not guilty" of damaging the Kingsnorth smokestack.

The question remains about the fallout of the verdict. At present there is some talk of passing a law in Britian to stop climate protesters from damaging or stopping the operation of coal plants; but until then, protesters can damage or tie up operations of coal plants in Britain and claim that "the climate made me do it."

Greenpeace UK

*Hansen and Gore made me do it?*

Gore's comment featured by Greenpeace UK's video of the event: "I can't understand why there aren't rings of young people blocking bulldozers and preventing them from constructing coal-fired plants."

## Return of the Global Warmers' Sacred Icon

The U.S. Climate Science Program (http://www.climatescience.gov/) released a draft of its full report for public comment in July, which featured the return of the most holy icon of the climate swindle, the "hockey stick" temperature graph of Michael Mann et al.

The infamous Mann hockey stick shows a fairly level temperature for most of the past 2,000 years, which comprises the shaft of the hockey stick, but then a sudden, steep rise in temperatures in the 1990s, which makes up the blade of the hockey stick. The 2,000-year even temperature depiction, of course, denies both the Medieval Warm Period from about the 10th to 14th Century, and the Little Ice Age of the 16th to mid-19th Century, which followed it. By keeping the temperature record flat, Mann et al. can assert that the steep rise is entirely caused by man's activities.

The return of the hockey stick was a shock, because it had been so thoroughly debunked by a congressional committee in 2006, and in a report and conference hosted by the National Academy of Sciences that the same year.

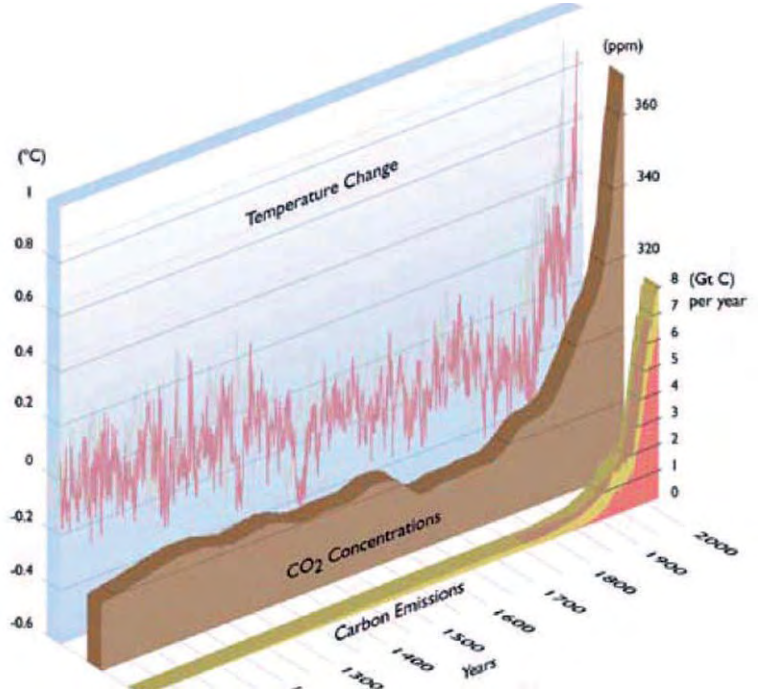
In September, Mann et al. released a report titled "Proxy-based reconstructions of hemispheric and global surface temperature variations over the past two millennia" (http://www.pnas.org/content/105/36/13252.full.pdf), in which Mann claims to show that the hockey stick was not just a statistical trick. He did not rely on tree rings for this reconstruction, Mann says, as he had in the 1998 paper.

But this new paper meets a very different audience than that of the first hockey stick paper in 1998. This time, readers have been educated by the work of Steve Mcintyre and Ross Mckitrick, on their website Climateaudit (www.climateaudit.org/), which shows how Mann's reconstructions are put together by cherry-picking the data. Mcintyre has worked tirelessly to get the data and source codes for this and other graphics that the global warmers will not release. So now, Mann's little secrets have been made available to a good part of the scientific community.

For those readers who would like to check out the construction of the hockey stick, there is a short, easy-to-understand online experiment at http://noconsensus.wordpress.com/2008/09/20/online-experiment-with the-latest-hockey-stick/.

### 'Climate Wars'

Meanwhile, to keep the pressure of the global warming scare going, BBC2 in




USCCSP

*The original Michael Mann hockey stick, shown here in the USCCSP report, cherry-picked its proxy temperature data. The "new" hockey stick uses only 5 percent of the available temperature proxy data.*

Britain aired a two-part program in September called "The Climate Wars," which attempted to return the sacred icon back to the respectibility it had in the 2001 "IPCC Third Assessment Report." That report featured the hockey stick on its cover, and five times in the text. The "Climate Wars" program pointed out that Michael Mann was not alone in finding the temperature hockey stick, but other researchers had done so as well. However, unmentioned in the BBC2 program is that all of the researchers who came up with similar hockey stick curves, have co-authored papers with Mann, or worked either with him or Phil Jones, the director of the Climate Research Center in Britain.

(Those global warmers who love to attack the "skeptics" as being in the hire of the oil companies, should note that this Climate Research Center was orginally funded by Shell Oil.)

Lord Monckton is right when he wrote in his rebuttal to the latest Mann paper (http://scienceandpublicpolicy.org/monckton_papers/rebuttal_of_rebuttal_of_ on_global_forces_of_nature_driving_the_earth_s _climate.html), that Mann et al. and U.S. climate scientist James Hansen should be put on trial for crimes against humanity, because the policies that they promote will kill millions of the world's poor.

## New Zealand MP Calls Al Gore a Phony

Rodney Hide, ACT Party Leader and Member of Parliament, gave a a speech to Parliament on Sept. 2, attacking the proposed emissions trading scheme for New Zealand (http://nzclimatescience.net/index.php?option=com_content&task=view&id= 342&Itemid=30). "The entire climate change-global warming hypothesis is a hoax, the data and the hypothesis do not hold together, Al Gore is a phony and a fraud on this issue, and the emissions trading scheme is a worldwide scam and swindle." Hide said.

"Enacting this legislation will cost New Zealanders dear—that is the point of it—and it will drive up the costs of basic goods and services for New Zealanders probably by at least $500 or $600 a year." Hide also noted that if passed, this emissions trading scheme would drive New Zealand farmers off their land, would send businesses and jobs from New Zealand with no environmental gain, and would do little or nothing for world weather.

The only proof of man-made global warming was a computer model that was created by an "obsure U.S. physicist," Hide said. That computer model gives a temperature curve in the shape of a hockey stick, he said, and when the world was given the computer model, researchers found that you could get the same hockey stick shape by putting in any set of numbers. "You could take the Wellington telephone directory, feed it into the model that the Intergovernmental Panel on Climate Chnage used in 2001, and we would get a hockey stick that saw the world running scared, that saw policy-makers running scared, and saw Al Gore make his movie based on it."

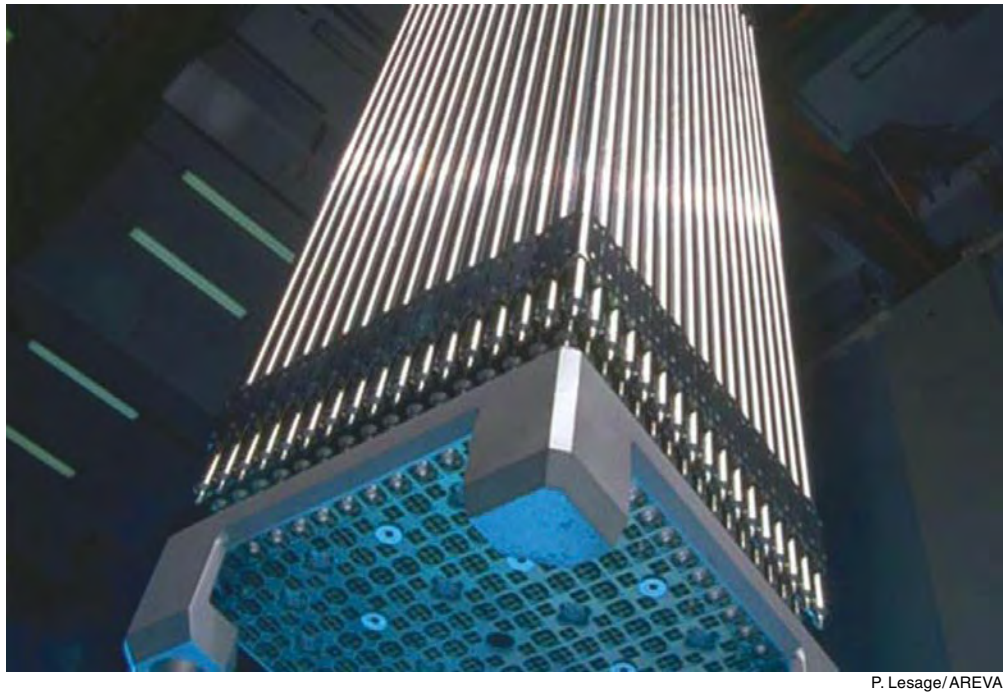
## Are Record Sales of Long Underwear Another Sign of Global Warming?

*Proof of global warming?*

According to an article in the *London Telegraph* Aug. 22, sales of thermal underwear increased 54 percent as compared to last year, while winter coat sales increased 76 percent for the same time period. Department store Debenhams' spokesman Ed Watson told the *Telegraph*: "The awful weather clearly has something to do with this hibernation hysteria." Watson also noted that with the increases in the cost of natural gas, it looks like many people will be turning to their wardrobe rather than the central heating

*Continued on page 55*

# We Need to Reprocess Spent Nuclear Fuel, And Can Do It Safely, At Reasonable Cost



P. Lesage/ AREVA

*by Clinton Bastin*

*A veteran nuclear reprocessing expert for the U.S. government recounts the little-known history of America's successful reprocessing program, and the unfortunate political decisions to thwart its progress.*

Reprocessing is the chemical separation of energy-usable materials from used nuclear fuel. It permits full use of nuclear materials that would provide a virtually inexhaustible energy resource that does not add pollutants to the atmosphere. It is also needed to separate weapons-usable materials from nuclear wastes so that the weapons-usable materials can be transmuted to non-weapons materials for beneficial use, and the wastes disposed of without need for indefinite safeguards, which cannot be assured.

Nuclear power plants in the United States and most nations use less than 1 percent of the energy in nuclear materials. In the best possible reprocessing concept, essentially *all* of the products produced in nuclear reactors could be recovered and put to beneficial uses.

*Above: Spent nuclear fuel can be reprocessed into new fuel like this mixture of uranium and plutonium oxides, called MOX, shown here at AREVA's MOX fabrication plant in France. One gram of MOX-recycled plutonium generates as much electricity as one ton of oil.*

Decision-makers for every light water reactor built in the world to date had the full expectation that spent fuel would be reprocessed, the remaining energy values would be recycled for production of energy, and the weapons-usable plutonium would be destroyed in producing pollution-free electricity.

Reprocessing, integrated with mixed uranium-plutonium fuel fabrication in a well-designed, well-managed fuel recycle complex, would assure that weapons-usable materials would remain inaccessible until they were transmuted to non-weapons usable materials. Reprocessing and recycle are thus essential components of good nonproliferation practice.

I would like to explain how loss of reprocessing is largely the result of many years of mismanagement, misinformation, and misdirection by the Department of Energy and its predecessors, beginning in 1944. I would also like to set the record straight and make the case for restarting U.S. reprocessing on the successful model of the Savannah River Plant, which was operated for the U.S. government by DuPont, from 1950 to 1989.

**Editor's Note:** This highly informed description of the fiasco which befell nuclear fuel reprocessing in the United States, penned by one of the nation's leading experts in the field, should be known to every American and every person interested in the future of mankind. The reader should also be aware of a point, not addressed in this article, that more advanced scientific techniques, such as plasma isotope separation, based on new physical principles, will some day be applicable to both nuclear fuel enrichment and reprocessing. Although these more modern methods have not yet been brought to the development stage, that is only because of the continuing opposition to scientific innovation, which is part of the design for world population reduction and zero technological growth from powerful political and financial forces.

One of these methods, atomic vapor laser isotope separation (AVLIS), developed in the 1980s for uranium enrichment, was brought to fruition; a pilot facility was completed at Lawrence Livermore National Laboratory in 1997, which demonstrated industrial capability, using full-scale hardware over a several-month period. But under privatization, the program was shut down on the basis that the old enrichment technology would provide larger shareholder dividends in the immediate term. Another technology, the fusion plasma torch, conceived in the 1960s, despite great promise, has met a similar fate.

### Savannah River vs. the Laboratory Model

The Savannah River Plant had a successful, safe, and efficient reprocessing history, on an industrial level, operated by the DuPont Company (Bebbington 1990). DuPont had also successfully managed reprocessing for the nuclear materials production programs of the Manhattan Project (Hewlett and Anderson 1972). Those experiences provide full assurances that reprocessing of used fuels from nuclear power plants in the United States, and those in other nations, could be done safely, successfully, cost-effectively, and without a credible threat of proliferation.

DuPont became involved in reprocessing in October 1942. Manhattan Project director, General Leslie Groves, recognized that the complexities of reprocessing needed to support a large nuclear program would be a difficult challenge even to the most experienced chemical engineering organization. He asked E.I. DuPont de Nemours and Company to design, build, and carry out experiments in a reprocessing pilot plant, and to design, build and operate production-scale reprocessing facilities.

Manhattan Project scientists were disappointed with the decision to use industrial corporations. They believed that they had earned the right to carry out their work to completion and were able to do so. But most of these scientists had no experience operating complex technology on an industrial scale.

Recognizing the importance of the Manhattan Project effort, DuPont accepted General Groves's request, but insisted that DuPont provide corporate management for the activity and engineering design for major projects, similar to those for its commercial activities. DuPont also requested that Manhattan Project scientists who had developed reprocessing processes participate in pilot plant experiments.

The reprocessing pilot plant built at Oak Ridge, Tennessee, was not configured for extended operation or maintenance; it was intended for only a few experiments to assure success in scaling up for production facilities. After a few experiments to confirm and improve process concepts developed by the scientists, DuPont left Oak Ridge to build and operate the Hanford Engineering Works in Washington, which included three large, canyon-type reprocessing plants.

The plant design was called a "canyon" because of the very large—60 feet high, 700- to 1,100-feet long—thick-walled, heavily reinforced concrete structure, in which remotely operated and maintained equipment was installed at the bottom to carry out the chemical processing. A large crane for rapid removal and replacement of failed equipment was at the top of the canyon, and there was room to move failed equipment out of the canyon space. From above the processing equipment, the structure looks like a canyon.

The canyons and processing equipment, piping, and instruments were configured for safe and high capacity operation; containment of radioactivity under all credible conditions, including fires and explosions; good material accountability; rapid, remote removal and replacement of failed equipment; and rapid move to full productivity after the start of operations.

The "T" canyon at Hanford was operated safely, successfully, and with minimal radiation exposure to workers to recover plutonium from irradiated natural uranium by a precipitation process (Hewlett and Anderson 1972).

The "U" canyon was used shortly after World War II to recover uranium not recovered earlier, using a solvent extraction process (Bastin A). The "B" canyon was used many years later to recover isotopes from nuclear waste.

After the war, in 1946, the General Electric Company as-

sumed responsibility for operations at Hanford, but did not provide corporate management of the activity. Significant problems developed, particularly in the PUREX reprocessing plant. (PUREX stands for Plutonium and Uranium Recovery by Extraction.) Among the most severe problems was close coupling of process systems, which resulted in the plant taking a long time to reach full productivity after the start of operations.

There was also a lack of storage capacity for nuclear waste generated during startup, which resulted in the need to dispose of large amounts of nuclear waste to soils. This problem was most difficult during the initial attempt to start operations after completion of construction, in 1956, and resulted in a two-year delay in operations. In 1972, Hanford PUREX was shut down because it could not be operated without large releases of nuclear waste to soils, which was then a violation of AEC rules (Bastin E).

*The Oak Ridge Pilot Plant.* After DuPont left Oak Ridge, Manhattan Project scientists who had participated in experiments continued to operate the pilot plant and recovered 326.39 grams of plutonium (Jolley et al. 1994). However, the pilot plant managers believed they had recovered *several kilograms* of plutonium.

# Completing the Nuclear Fuel Cycle

The concept of used nuclear fuel as "nuclear waste" is a fiction created by the opponents of nuclear energy. Used nuclear fuel isn't waste at all, but a renewable resource that can be reprocessed into new nuclear fuel and valuable isotopes.

When we entered the nuclear age, the great promise of nuclear energy was its renewability, making it an inexpensive and efficient way to produce electricity. It was assumed that the nations making use of nuclear energy would reprocess their spent fuel, completing the nuclear fuel cycle by recycling the nuclear fuel after it was burned in a reactor, to extract the 95 to 99 percent of unused uranium in it that can be turned into new fuel.

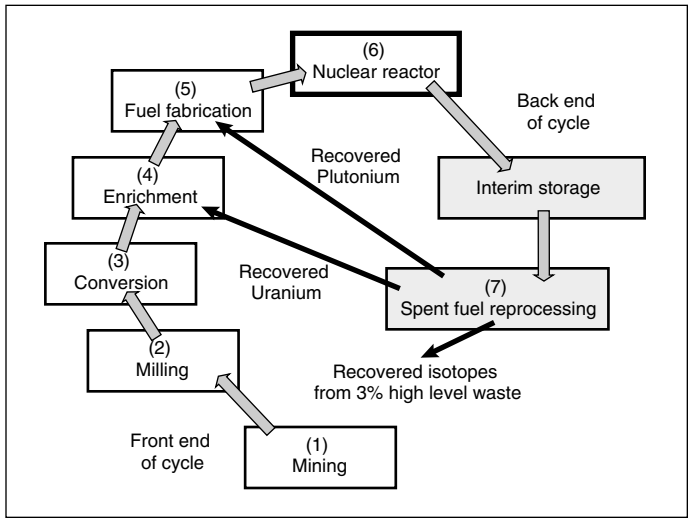
This means that if the United States buries its 70,000 metric tons of spent nuclear fuel, we would be wasting 66,000 metric tons of uranium-238, which could be used to make new fuel. In addition, we would be wasting about 1,200 metric tons of fissile uranium-235 and plutonium-239, which can also be burned as fuel. Because of the high energy density in the nucleus, this relatively small amount of U.S. spent fuel (it would fit in one small house) is equivalent in energy to about 20 percent of the U.S. oil reserves.

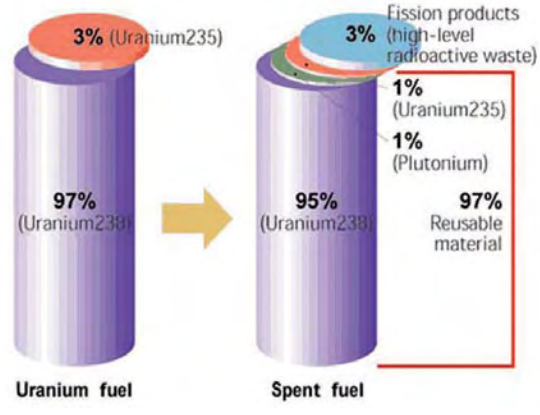
About 96 percent of the spent fuel the United States is now storing can be turned into new fuel. The 4 percent of the so-called waste that remains—2,500 metric tons—consists of highly radioactive materials, but these are also usable. There are about 80 tons each of cesium-137 and strontium-90 that could be separated out for use in medical applications, such as sterilization of medical supplies.

Using isotope separation techniques, and fast-neutron bombardment for transmutation (technologies that the United States pioneered but now refuses to develop), we could separate out all sorts of isotopes, like americium, which is used in smoke detectors, or isotopes used in medical testing and treatment. Right now, the United States must import 90 percent of its medical isotopes, used in 40,000 medical procedures daily.

The diagram shows a closed nuclear fuel cycle. At present, the United States has no reprocessing, and stores spent fuel in pools or dry storage at nuclear plants. Existing nuclear reactors use only about 1 percent of the total energy value in uranium resources; fast reactors with fuel recycle would use essentially 100 percent, burning up *all* of the uranium and actinides, the long-lived fission products.

In a properly managed and safeguarded system, the plutonium produced in fast reactors would remain in its spent fuel until needed for recycle. Thus, there need be no excess build-up of accessible plutonium. The plutonium could also be fabricated directly into new reactor fuel assemblies to be burned in nuclear plants. —*Marjorie Mazel Hecht*




Federation of Electric Power Companies of Japan

*Ninety-seven percent of spent nuclear fuel is reusable!*

Relying on the statements by Oak Ridge National Laboratory managers about their successful production campaign in the Oak Ridge pilot reprocessing plant, Atomic Energy Commission managers asked ORNL scientists and engineers to direct the design, construction, and start-up operation of the Idaho Chemical Processing Plant (ICPP), which was configured like the Oak Ridge pilot reprocessing plant. The ICPP was built to reprocess all highly enriched uranium irradiated in U.S. nuclear reactors, including those operated at the Savannah River Plant for production of tritium for the weapons program.

W.P. Bebbington, *History of DuPont at the Savannah River Plant*

*Aerial photo of the Savannah River Plant, which operated from the early 1950s until 1989.*

Problems at the Idaho Plant were apparent during early attempts at start-up, in 1952. Ventilation filters to prevent the release of radioactivity became plugged and were removed. Productivity for many years was only a few percent of rated capacity. The American Cyanamid Corporation had been selected to operate the Idaho Plant, but realized that the facility could not be operated safely or successfully, and left. Phillips Petroleum Company, which operated the Materials Test Reactor at the Idaho site, agreed to operate the Idaho Plant, but did not provide adequate corporate management (Jolley et al. 1994).

W.P. Bebbington, *History of DuPont at the Savannah River Plant*

*A "canyon" reprocessing building in construction at the Savannah River Plant operated by DuPont. The key to the plant's success was the industrial production methods which focussed on safety and high capacity operation.*

**The Savannah River Success**

In 1950, President Harry S. Truman emphasized DuPont's success in design, construction, and operation of the Hanford Engineer Works in a July 25 letter requesting that DuPont design, construct, and operate the Savannah River Plant (Bebbington 1990, Bastin C).

Again, operations by DuPont were highly successful. The Atomic Energy Commission reported that the company had achieved the best-ever safety for both construction and operation (USAEC 1975). Factors critical to successful operation in the Dupont reprocessing plants were the plant configuration, equipment and piping layout, type of equipment, remotability features, remote maintenance system, intersystem tankage, sampling systems, ventilation, containment, safeguards and accountability, and so on. It was demonstrated that significant differences in these non-process components could make as much as two orders of magnitude difference in operability or unit cost of operations—and could in some cases preclude operations.

The two reprocessing plants at Savannah River, "F" and "H" canyons, reached full-capacity operation within a few weeks after completion of construction, reprocessing irradiated natural uranium for production of plutonium for the weapons program. The plants used the PUREX system (see box, p. 14). Highly enriched uranium fuels irradiated in Savannah River reactors to produce tritium for weapons use were shipped to the Idaho plant for reprocessing.

But by 1957, the low productivity of the ICPP resulted in large accumulations of irradiated highly enriched uranium fuels from Savannah River reactors. To avoid a threat to tritium and nuclear weapons production, a decision was made to increase the capacity of the "F" reprocessing plant at the Savannah River Plant for reprocessing of natural and low enriched uranium fuels for production of plutonium, and to convert the "H" reprocessing plant to reprocess highly enriched uranium.

In October 1957, the Atomic Energy Commission issued its

summary report, "AEC Reference Fuel-Processing Plant (WASH 743)," which it presented as a model for nuclear power plant fuel reprocessing. The model was based on the ORNL-built Idaho Plant, which the report indicated had operated *not at less than 3 percent,* but at 80 percent productivity—an overstatement by a factor of 30 (Bastin F)! The Atomic Energy Commission proposed to use the ORNL/ICPP technology for reprocessing U.S. nuclear power plant fuels, and also began to transfer the ORNL/ICPP reprocessing technology to many other nations, including India (Bastin I).

Earlier, the U.S. Atomic Energy Commission, as the first supply of "Atoms for Peace," had provided heavy water for use in reactors supplied by Canada. These reactors were similar to the one operated by Canada, under a mutual security agreement, to produce plutonium for U.S. nuclear weapons. Supply of the ORNL/ICPP reprocessing technology permitted recovery of the plutonium produced in these reactors. India used its plutonium from one of these reactors for a nuclear explosive test, in 1974, and later for nuclear weapons (Bastin I). Supply of the ORNL/ICPP reprocessing technology also undermined America's most important nonproliferation initiative, the policy for return of used fuel of U.S. origin or from reactors supplied by the United States (Bastin B).

### The ICPP: A Failed Model

The use and export of ICPP reprocessing technology also led to the failure of commercial reprocessing in the United States, instead of the success it could have been, and to problems with reprocessing worldwide. The failure of nuclear and political leaders to recognize the difference between successful and failed reprocessing led to the myth that reprocessing was a proliferation threat and should be deferred. Its deferral precluded responsible disposal of nuclear wastes, an argument used to justify the long moratorium on new nuclear power plants in the United States.

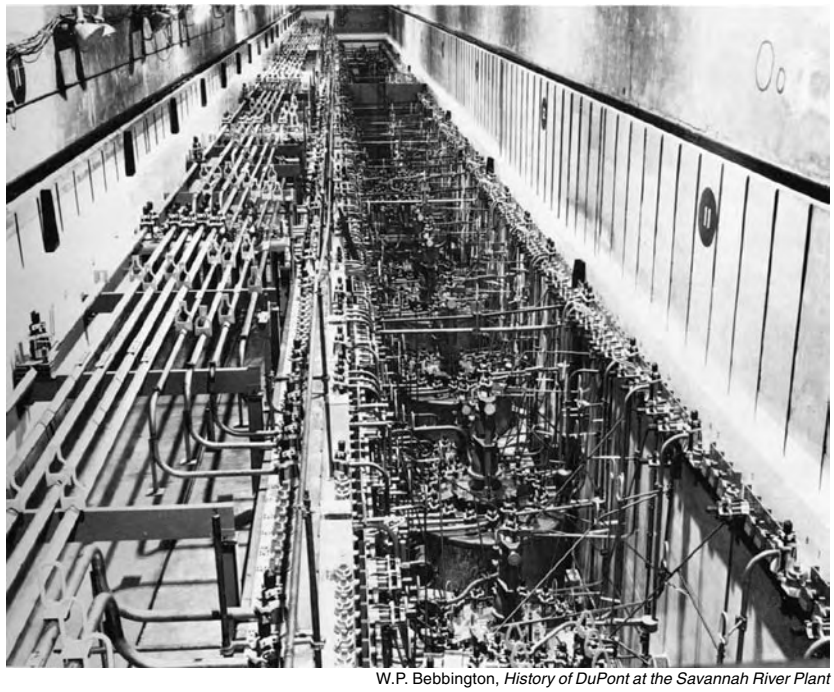
A good understanding of experience provides a basis for a better approach for reprocessing that will lead to more viable nuclear programs. Particularly important in reprocessing are:

- differences between laboratory-type reprocessing and that needed for nuclear power,
- the basis for decisions that led to successful and unsuccessful reprocessing, and
- the DuPont design for a "Spent LWR Fuel Recycle Com-

## PUREX: How Reprocessing Works

Separation of uranium and plutonium from high-level waste and from each other in a nuclear fuel reprocessing plant is accomplished using mixer-settler chemical process equipment. Think of this operation as like a bottle of Italian dressing. The vinegar/water mixture on the bottom simulates the nitric acid/water solution of uranium, plutonium, and fission products in the feed to a mixer-settler. The salad oil on top simulates the tri-butyl-phosphate/kerosene mixture used to extract the uranium and plutonium.

Add the proper chemicals to the kerosene (oil) in the top of the bottle, shake thoroughly, and the plutonium and uranium are extracted into the kerosene, leaving the fission products (high-level waste) in the nitric acid/water at the bottom of the bottle. Pour off the kerosene containing the plutonium and uranium, add some different chemicals, then mix the kerosene with concentrated nitric acid. The plutonium is extracted into the nitric acid, leaving the uranium in the kerosene.



W.P. Bebbington, *History of DuPont at the Savannah River Plant*

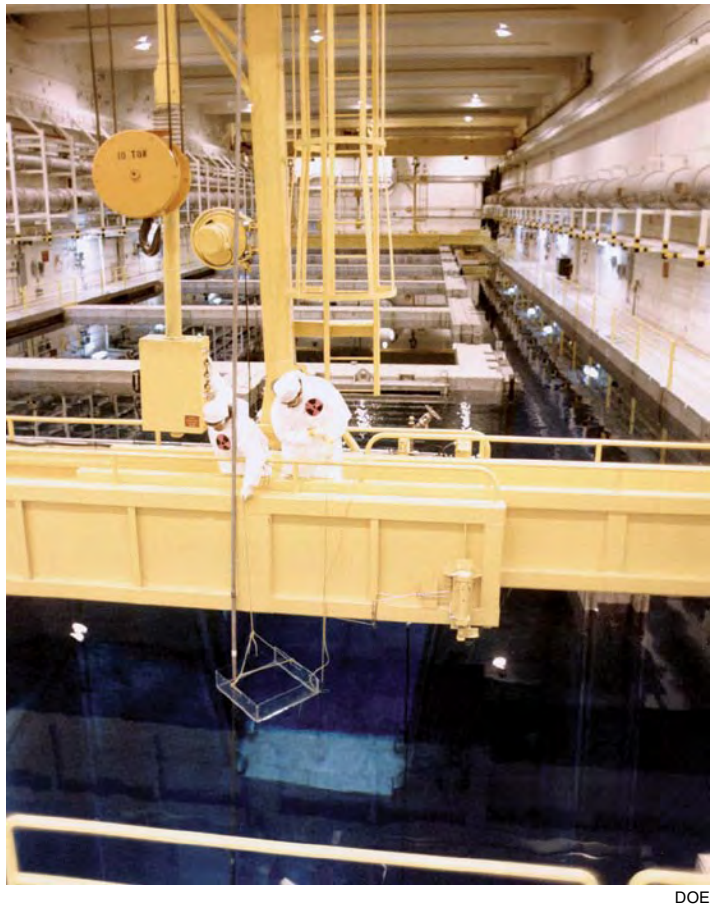
*Looking down on a 60-foot high canyon cell, showing typical process vessels and connectors that separate uranium and plutonium from spent fuel.*

Simple. Except not so simple in a radiation field where exposure for about 20 seconds would be a lethal dose of radiation. As the short-lived fission products in spent fuel decay over a period of time, the radiation is reduced, and after a few hundred years the process becomes almost as simple as described here.

plex" that would have avoided access to, and accumulations of, separated plutonium and resolved other problems and concerns (DuPont 1978).

The initial Atomic Energy Commission program for disposition of used nuclear power plant fuels was based on receipt, storage, and reprocessing at Savannah River Plant facilities, operated by DuPont (Bastin B). But some Atomic Energy Commission officials promoted the concept identified in the Atomic Energy Commission Reference Fuel Reprocessing Plant, cited above (USAEC 1957). The Industrial Reprocessing Group, composed of officials of early nuclear power plant vendors and operators, and Davison Chemical Company (a division of W.R. Grace and Company), with consultants from the Idaho plant, Oak Ridge National Laboratory, and Hanford (but *not* the Savannah River Plant), endorsed the ORNL/ICPP concept, and commercial reprocessing using this concept was initiated at West Valley, N.Y., in a facility destined for failure.

Problems at West Valley began immediately after startup. Productivity of 30 percent was achieved, but process losses and radiation exposures to workers were more than a factor of 10 larger than those at the Savannah River Plant, and final products often failed to meet specifications. During the sixth and final year of operation, average radiation exposures to personnel were well above Federal standards and rising, and the release of radioactivity to surface streams exceeded technical specifications. In 1972, Atomic Energy Commission regulatory authorities ordered a halt of operations (Low 1972).



DOE

*The Idaho Chemical Processing Plant was built on the model of the Oak Ridge National Laboratory pilot plant, and was plagued with failures and low productivity. Here, a view of the interior of the ICPP.*

Operations at the Idaho Plant, meanwhile, continued at very low productivity, and by 1966, inventories of used highly enriched fuels at Idaho approached the total storage capacity. The Atomic Energy Commission carried out a review for reprocessing of these fuels, and some of the fuels were reassigned to the Savannah River Plant and delivered there (Bastin C). However, ICPP operators published a "Multiple Fuels Processing Program" report that showed an economic advantage for reprocessing of certain highly enriched uranium fuels at the ICPP, and the Atomic Energy Commission decided to continue operations there.

Subsequent annual Multiple Fuels Processing Program reports showed attractive economics for reprocessing at the Idaho Plant (USAEC 1968 and ff.). In 1967, the Allied Chemical Company accepted responsibility for operation of the ICPP. Allied Chemical managers reviewed the Multiple Fuels Processing Program reports which had indicated attractive economics for reprocessing, and, in partnership with General Atomics Corporation, as Allied General Nuclear Services (AGNS), decided to build the Barnwell Nuclear Fuel (reprocessing) Plant in South Carolina, at an estimated cost of $40 million (Bastin C).

### More Failed Reprocessing Ideas

At the same time, the San Diego-based company General Atomics was attempting to commercialize its High Temperature Gas-cooled Reactors, which required reprocessing. General Atomics relied on the favorable fuel-cycle economics, based on reprocessing in a conceptual plant designed by the ICPP technical staff. Federal funding of $30 million was provided for modification of the Idaho Plant to permit demonstration of HTGR fuel reprocessing (Bastin C, D). (HTGR fuel consists of tiny particles of uranium, each encased in layers of graphite and special ceramics; these fuel particles are then formed into rods or tennis-ball size "pebbles.")

In 1974, Allied Chemical and General Atomics officials learned that:

- Statements of production in annual Multiple Fuels Processing Program reports, which indicated favorable economics for reprocessing at the Idaho Plant, were overstated by a factor of 5 (Bastin F).
- The costs of the conceptual HTGR fuel reprocessing plant were underestimated by a factor of 10.
- The cost for modification of the Idaho Plant to permit a demonstration of HTGR fuel reprocessing was underestimated by more than a factor of 10.

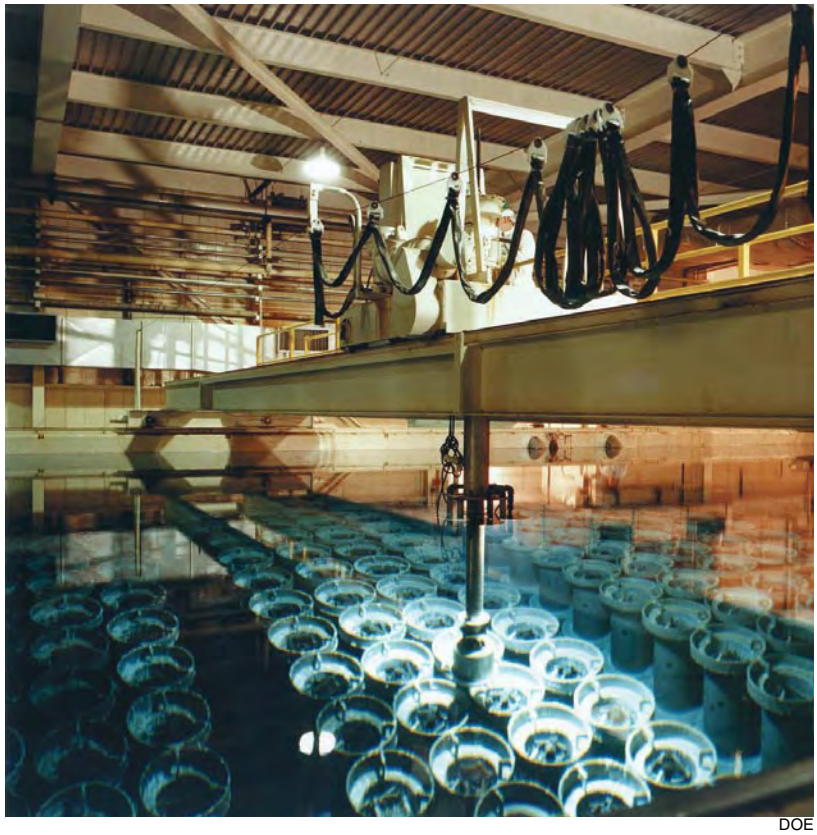
The Atomic Energy Commission then abandoned plans to

demonstrate HTGR fuel reprocessing, and General Atomics abandoned plans to commercialize the HTGR (Bastin E). Officials of Allied General Nuclear Services, aware that the concept adopted for the Barnwell reprocessing plant was not valid, notified the Atomic Energy Commission that it would not operate the plant for commercial reprocessing and proposed that it be operated as a government demonstration.

During the same time period, General Electric built the Midwest Fuel Recovery Plant at Morris, Illinois. In an attempt to reduce size and capital cost, GE used much more complex processes for reprocessing than those used at Savannah River. Numerous equipment failures and problems were encountered in cold testing that made it impossible to operate the plant, and GE senior executives carried out a corporate review of the technical and operational capability of the plant, which identified many problems. Among the most significant was the following:

"It thus appears that the time required to stabilize the process and obtain useful output may well exceed the mean time between failure. If this should be the case, it would be difficult to be able to run long enough to obtain some output, and time operating efficiency (productivity) would be close to zero."

GE decided not to operate that plant (Reed 1974).



DOE

*Despite the problems known with the Oak Ridge/Idaho Plant concept, the West Valley, N.Y. commercial reprocessing plant was built using this concept, instead of the successful method of the Savannah River Plant. It was a facility "destined for failure," Bastin says. Here, the fuel receiving and storage area at the West Valley plant in 1982.*

**Reprocessing in Other Nations**

Nuclear program leaders in Britain, France, Germany, India, Japan, and the Soviet Union were aware of problems with the Oak Ridge/Idaho pilot plant reprocessing technology and the success of DuPont technology. In 1970, French reprocessors visited the United States with a promise of access to DuPont technology, but after their arrival, the Atomic Energy Commission denied them access (Bastin C).

The Soviet Union gained an understanding of DuPont technology through intelligence efforts, but in its own reprocessing plants, it did not provide adequate protection against accidents, contrary to the DuPont system (Bastin C).

Britain had access to DuPont technology through a classified cooperative agreement, but relied on a philosophy of "no maintenance"—again, contrary to the DuPont system—until there was a severe accident in an early British reprocessing facility in 1973 (Bastin C, E).

France attempted management of reprocessing by its Atomic Energy Commission and encountered serious problems. Its technology was based largely on the Oak Ridge/Idaho pilot plant reprocessing concept, with provision for rapid removal of certain more sensitive process equipment (Bastin 2007). Since the creation of a state corporation, COGEMA, France has improved reprocessing, and, in the absence of DuPont reprocessing technology, has dominated world reprocessing activities. However, the high cost and other features of the most recent French-built reprocessing plant, that of Japan at Rokkasho Mura, raise serious questions about the French technology.

After a thorough review of reprocessing successes and failures, and particularly of the failures and other problems with commercial reprocessing, the Atomic Energy Commission in 1974 reassigned responsibility for support of commercial fuel reprocessing to DuPont with its emphasis on safe, successful, cost-effective reprocessing. At a meeting at its New York offices in July 1974, the Edison Electric Institute Nuclear Fuel Cycle Committee expressed strong support for this reassignment.

**The DuPont Facility That Was Never Built**

DuPont carried out its own research and development and supported outside work focussed on conceptual design studies for a licensed fuel recycle complex. The design studies were completed in November 1978 and reports issued. Costs for the 3,000 tons/year integrated fuel reprocessing/fabrication facility were estimated at $3.7 billion. Special features of this facility included:

- no access to or accumulation of separated plutonium,

• total loss of plutonium to waste for fuel recycle would be about 5 percent of that lost in the U.S. commercial nuclear fuel recycle program,

• high-level nuclear wastes would be prepared for long-term isolation in a geologic repository and there would be no storage of liquid wastes in underground tanks,

• indefinite (hundreds of years) life of facility,

• flexibility for major changes, including processing other types of fuels,

• costs for reprocessing of about one-fourth of that of current reprocessing prices, and

• other features based on successful reprocessing experiences at the Savannah River Plant (DuPont 1978; Bastin E, G).

Many problems and concerns about reprocessing worldwide would have been resolved, if there had been a continuation of research and development by DuPont, the subsequent construction and operation of the DuPont facility, and a sharing of the technology with other nations which had large nuclear power programs and with the International Atomic Energy Agency (Bastin H).

But in January 1975, under the Ford Administration, programs of the Atomic Energy Commission were transferred to a newly created agency, the Energy Research and Development Administration. Nuclear program leaders in the new ERDA did not understand the complexities of reprocessing, set aside those who did, and transferred program responsibilities back to the Office of Nuclear Energy, successor to the Atomic Energy Commission Division of Reactor Development.

Presidents Gerald Ford and Jimmy Carter carried out major policy reviews of reprocessing *with no input from persons who understood the technology* and who knew what had happened that led to successes, failures, proliferation, and other problems. The indefinite deferral of efficient use of nuclear energy resources and responsible disposal of nuclear wastes resulting from these reviews were major factors contributing to the long mora-

## The Reprocessing Facility

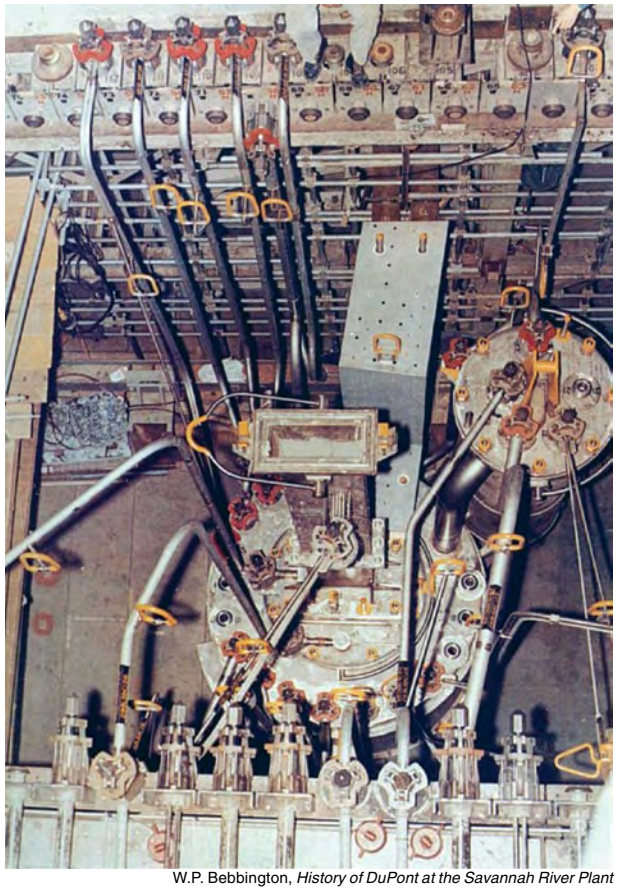
The chemical processes used in reprocessing are only one component of reprocessing "technology." Also critical to successful operation are the plant configuration, equipment and piping layout, type of equipment, remote control features, remote maintenance system, intersystem tankage, sampling systems, ventilation, containment, safeguards and accountability, and so on.

Significant differences in these non-process components could make as much as two orders of magnitude difference in operability or unit cost of operations—and could in some cases preclude operations.

During the mid-1950s to mid-1970s, the Idaho Chemical Processing Plant and the reprocessing facilities at the Savannah River Plant used similar processes, but operability (and many other important parameters) were vastly different.

On-stream time during periods of product demand were more than 80 percent at Savannah River, and only about 2 to 3 percent at the Idaho Plant. Failure of a major piece of equipment resulted in one day of lost operating time at Savannah River, and up to one to two *years* at the Idaho Plant. Return to equilibrium (that is, productive operation) after shutdown for maintenance, accountability, or other reasons at Savannah River would take a few minutes; it would take about 30 days at the Idaho Plant and about 8 days at the Hanford PUREX facility.

The DuPont plant was designed with more safety protections for plant workers. For example, equipment maintenance at the Idaho Plant resulted in large radiation exposure to personnel, because personnel were required to enter process cells for direct maintenance of equipment. Average radiation exposures to operating and maintenance personnel at the Idaho Plant were about a factor of 3 higher than at Savannah River and Hanford on an overall basis, and a factor of some 50 to 100 times higher on a unit of production basis.



W.P. Bebbington, *History of DuPont at the Savannah River Plant*

*Looking down on a 60-foot high canyon cell, showing typical process vessels and connectors that separate uranium and plutonium from spent fuel.*

torium on new nuclear power plants in the United States. Under President Carter, ERDA was dissolved and the Department of Energy was organized to take its place in 1977.

Nuclear program leaders in the DOE set aside information from DuPont about reprocessing that would have resolved problems, and instead they supported use and development of laboratory concepts that had no potential for success. No information about the success-based concepts was provided to Presidents Carter or Reagan.

President Reagan was elected in 1980 on a platform of support for reprocessing, but was unwilling to support operation of the Barnwell Plant.

The DOE funded the development of an Oak Ridge National Laboratory concept for reprocessing with the PUREX process, but incorporating a very complex, in-place maintenance system, until a cost estimate based on detailed design indicated an exceptionally high cost. The ORNL program continued as a collaborative development with Japan, and the complex maintenance system was incorporated in the very expensive Japanese reprocessing plant at Rokkasho Mura.

In 1990, the Oak Ridge program was phased out, in order to fund development of an Argonne National Laboratory pyroprocessing concept for separating uranium, plutonium, and other heavy elements from highly radioactive waste in fast reactor fuel. The pyrometallurgical process is claimed to be proliferation-resistant. An evaluation by DOE staff knowledgeable about reprocessing revealed that the concept was neither proliferation-resistant nor appropriate for reprocessing (see box, p. 19). There was no disagreement with this evaluation by Department of Energy or Argonne National Laboratory officials, but support for the concept continues.

**Advanced Reprocessing Technologies**

The DOE now proposes funding for so-called "advanced reprocessing technologies" as part of its Global Nuclear Energy Partnership (GNEP) initiative, but the processes proposed — UREX+ and pyroprocessing—are neither advanced nor appropriate for reprocessing of used nuclear fuels.

Decisions of Manhattan Project Director Gen. Leslie Groves in 1942, and President Truman in 1950, that resulted in successful reprocessing in the past provide a model today for successful reprocessing of nuclear power plant fuels. Similar decisions of Atomic Energy Commission leaders in 1959 and 1974 would have led to success and avoided many problems. Note also that assurance of safeguards for weapons-usable materials in the used fuel—which is impossible. The moratorium on new nuclear power plant orders in the United States began in the same year—1974—that commercial reprocessing stopped.

This moratorium is the greatest reason for America's energy crisis and resulting economic challenges, including the huge budget deficits in California.

## The Cost of Reprocessing

The costs for reprocessing in the DuPont-designed LWR Fuel Recycle Complex would have been about $250 per kilogram of uranium. This compares to about $1,000 per kilogram charged by the British and French for reprocessing, and $5,000 to $15,000 per kilogram for reprocessing in the French-built facility at Rokkasho Mura in Japan.

The major reason for the differences in cost is that there is much higher productivity with the DuPont design because of its shorter time for replacement or repair of failed process equipment, piping, and instruments, and the shorter time to full productivity afeter the start-up of operations.

The much higher cost of reprocessing at the Rokkasho plant is the result of a much more complex—and expensive—laboratory-type, in-place remote maintenance system. In-place maintenance results in greater loss of operating time, compared with the much more simple, rapid, remote equipment replacement system of DuPont, followed by hands-on repair at leisure.

Atomic Energy Commission of Japan

*The now-operating Rokkasho Reprocessing Plant in Japan, when it was under construction. Its operating costs are higher, Bastin says, because it did not incorporate the successful concepts of Savannah River.*

**The Cost of Not Reprocessing**

Of course, the greatest difference in cost is that between reprocessing and not reprocessing.

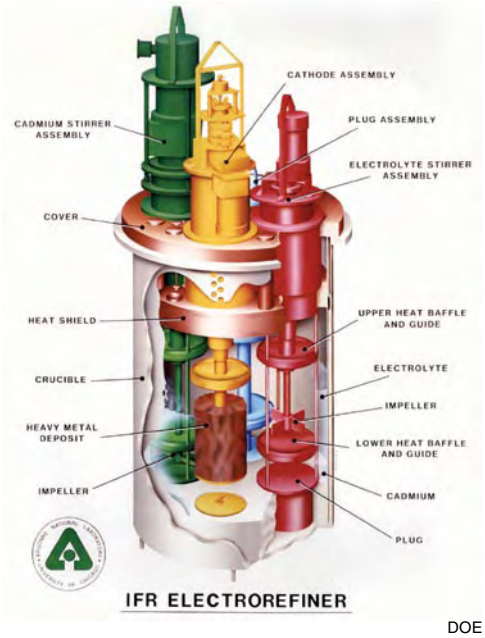
Without reprocessing, highly radioactive wastes in used fuel cannot be permanently disposed of without indefinite

# Pyroprocessing and the Integral Fast Reactor: A Case Study of So-called Proliferation-Resistant Fuel

*by Clinton Bastin*

In 1991, I was assigned by DOE's Office of Nuclear Energy to develop criteria for evaluation of a planned demonstration of DOE's Integral Fast Reactor (IFR) "proliferation-resistant," "pyroprocess-based" fuel cycle. I visited DOE sites in Chicago and Idaho to inspect process equipment and details of planned demonstration operation, and learned that DOE plans were for a demonstration of a *process,* not technology, and that questions of operability, maintainability, safeguardability, and containment of radioactivity—major problems with commercial reprocessing—would not have been resolved.

Of greatest concern were great difficulties for material balance measurements and high plutonium losses. These findings led to a conclusion that the safeguards challenge would be difficult and the process as planned would not be proliferation-resistant nor viable for commercial nuclear fuel recycle.




DOE

*Artist's drawing (1989) of an electrorefiner for the Integral Fast Reactor, which would recycle the reactor's spent fuel, returning the high level wastes to the reactor to be burned as new fuel. Bastin's evaluation was that the prcess was not commercially viable.*

Concerns about the planned demonstration were reviewed with DOE and DOE laboratory management and technical staff without significant disagreement, and are summarized here:

(1) Processes to be used were similar to those used for plutonium *metal* processing in the Atomic Energy Commission weapon programs. Much greater difficulty was experienced in plutonium metal processing than in properly designed aqueous reprocessing. Large accumulations of scrap were normal at all plutonium metal plants, except for those at the Savannah River Plant where scrap was immediately redissolved and returned to reprocessing.

In earlier, similar fuel cycle experiments, large amounts of scrap were shipped to the Idaho Chemical Processing Plant for recovery.

(2) Equipment proposed for the DOE fuel cycle was much more complex than that used in aqueous reprocessing (the PUREX system) and would have been very difficult to maintain for reasonable on-stream time. In-situ manipulator-type maintenance would be needed. The rapid, remote equipment-replacement system used in successful reprocessing would not be appropriate.

(3) Material measurement in the electrorefiner was extremely difficult under cold, development conditions and was performed only about every year or two in the development facility. Measurement of fully irradiated fuel in a remote environment would be far more difficult; thus, material accountability and safeguards would be virtually impossible.

(4) High process losses (10-20 percent) were experienced, particularly in the fuel fabrication step, and high process losses would have been likely in electrorefining. This, combined with measurement difficulties, makes significant diversion detection impossible.

(5) Operations in a remote environment are about three times as difficult as operations in glove boxes; operations in an inert environment are similarly more difficult. The combination contemplated for the IFR fuel cycle might be ten times as difficult as those in glove boxes, or about three times as difficult as those in aqueous reprocessing, without consideration of the more complex equipment planned for the IFR process. High temperatures would further increase difficulties.

(6) The IFR process requires use of exotic materials that are not available in forms/shapes needed. Research for materials was under way, but there was no experience base for use of these materials.

(7) Inter-process transfer of nuclear materials requires physical movement of containers of nuclear material as opposed to transfer through piping in reprocessing plants that have operated successfully. The containers are not fully sealed. Thus, there is significant potential for release of contamination into the cell atmosphere.

(8) Fissile plutonium is in weapons-usable form and in concentrations usable for a significant nuclear explosive. Some reviewers argued that in-process materials may not be directly usable for weapons suitable for military stockpiles, but clever operators of electrorefining equipment might be able to produce fairly pure plutonium metal directly usable for military type nuclear explosives.

(9) The requirement for inter-process transfer by physical movement by manipulators of containers of nuclear material instead of through pipes would limit applicability of the IFR fuel cycle process to research, or production of small amounts of plutonium.

*—July 21, 2008*

DuPont's exceptional core values of safety, health and the environment, ethics, and respect for people were major factors in the success of reprocessing and other programs for the Manhattan Project and Atomic Energy Commission.

America needs real advanced reprocessing technologies, and a competent chemical engineering organization to manage reprocessing. I propose a "U.S. Energy and Nuclear Technology Board," or a similar organization, that will:

- implement and support policies and programs on the basis of need, determined through careful, competent assessment based on lessons learned from experiences,
- provide full and accurate information to Americans about energy and nuclear technology,
- carry out collaborative research and development with other nations for use of the best systems and technology for beneficial, efficient, and safe use of nuclear technology.

The President, leaders of Congress, and leaders of nuclear power programs should ask DuPont and others with extensive experience in successful reprocessing and other uses of nuclear technology to help create organizations to resolve long-neglected energy and nuclear technology challenges. Recent French experience in certain reprocessing techniques will be important for U.S. programs, but the French facility design should be examined carefully by those with experience in the best reprocessing technology. This nation has demonstrated successful reprocessing of spent nuclear fuels in the past, and if we are to move forward as an industrial nation, we need to do it again!

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*Chemical engineer Clinton Bastin, now retired, was responsible for the Atomic Energy Commission's reprocessing plutonium, and plutonium scrap operations, plutonium-238 production, transuranic materials processing, tritium and deuterium production for weapons programs, radioactive waste management, and related activities at the Department of Energy's Savannah River Plant. He was also involved in the diplomatic side of U.S. international nuclear efforts, and he was president of the Federal Employees Union at the Department of Energy headquarters.*

*Upon his retirement, Bastin was recognized by the DOE in a Distinguished Career Service Award as "the U.S. authority on reprocessing and initiator of total quality management and partnering agreements." Bastin served as a U.S. Marine in World War II and was an instructor in chemistry for the Marine Corps Institute.*

*He has many published papers on the topics in this article.*

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Clinton Bastin personal experiences:

(A) Participant in summer seminar for chemical engineering professors at Hanford on fuel reprocessing, including studies for disposal of nuclear wastes in soils at Hanford, June-August, 1958.

(B) Atomic Energy Commission technical leader for the initial, success-based program for disposition of used fuel from nuclear power plants in the United States and other nations, 1959-1962.

(C) Atomic Energy Commission technical leader at the Savannah River Plant and AEC/ERDA headquarters for reprocessing, plutonium processing, and studies for disposal of nuclear wastes, 1962-1976.

(D) Participant in monthly design reviews for reprocessing projects, DuPont corporate offices, Wilmington, Del., 1964-1972.

(E) Technical leader and task force chair at AEC headquarters for resolution of problems in AEC and commercial reprocessing facilities, and reduction of reprocessing-related proliferation threats, 1972-1974. Effort led to recommendations that reprocessing program direction and management be reassigned to those who had directed and managed successful reprocessing programs and understood reprocessing technology

(F) Compared Atomic Energy Commission accountability records with production data in 1968 through 1972 annual reports of Idaho Chemical Processing Plant Multiple Fuels Processing Program; learned that production was overstated in these reports by a factor of 5; and notified Atomic Energy Commission and Allied Chemical Company authorities of the discovery, 1973.

(G) Technical leader in Energy Research and Development Administration for nuclear power fuel reprocessing and recycle, until ERDA leaders reassigned reprocessing program direction and management to those who had directed, managed, and proposed failed reprocessing, and did not understand reprocessing technology, 1975-1976.

(H) Lead technical consultant to the International Atomic Energy Agency for its study of "Regional Fuel Cycle Centers," which had been proposed by the United States to reduce proliferation threats from reprocessing.

(I) Technical leader for major non-proliferation initiative with the Government of India.

(J) Instructor for "Worldwide Reprocessing Experiences and Plans" for CIA and NSA, 1968-1996.

(K) Technical leader for U.S. nonproliferation initiatives and proliferation threat assessments, 1970-1983.

(L) U.S. coordinator for reprocessing development and technology exchange with other nations, 1962-1993.

(M) Determined that an Argonne National Laboratory pyroprocessing process which was claimed to be proliferation-resistant was neither proliferation-resistant nor appropriate for reprocessing, and advised DOE and ANL officials of that determination, 1991 (see box).

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# The Subject of Principle: Project 'Genesis'

*by Lyndon H. LaRouche, Jr.*

March 14, 2008

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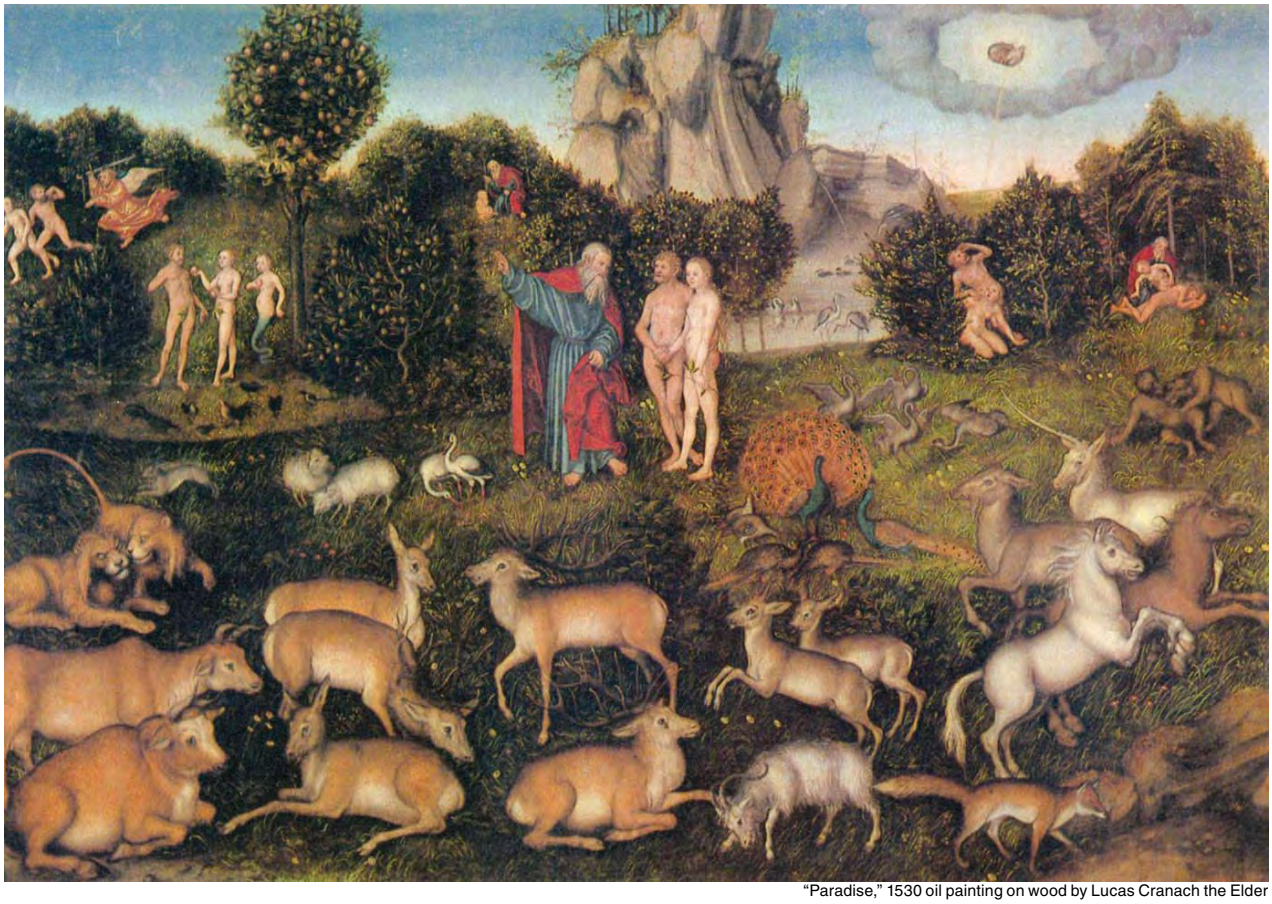
*Here, reference is made to the work of the circles of Carl Woese, et al., particularly to "Collective Evolution and the Genetic Code"[1] of Kalin Vetsigian, Carl Woese, and Nigel Goldenfeld of the Department of Physics and Microbiology and Institute for Genomic Biology, University of Illinois at Urbana-Champaign, Urbana, Ill. 61801, May 16, 2006.*

*My critical contribution here is limited to certain very important issues of epistemology* ►

1. See www.pnas.org/cgi/content/abstract/0603780103v1.



"Paradise," 1530 oil painting on wood by Lucas Cranach the Elder

*"The Noösphere is derived from a universal physical, cognitive principle of human life, a power of organization which does not exist within the species of the lower forms of life, such as the higher apes." Only man is able to increase the potential relative population-density of his species.*

*which have been posed implicitly by the pattern of an underlying assumption in the method employed there by Carl Woese and his associates. This present report emphasizes a return of attention to that argument of mine, which is rooted in the cognitive implications of Bernhard Riemann's work, which I presented in my "Vernadsky & Dirichlet's Principle," of* Executive Intelligence Review *for June 3, 2005 [also in* 21st Century, *Winter 2005].*

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Among those at *Executive Intelligence Review* who continue the contested themes of issues which occupied attention among the circles of the Fusion Energy Foundation (FEF) of the 1970s and 1980s, the work of Carl Woese et al. has been seen as a refreshing change of pace from the radically reductionist approaches to living processes which became popularized both during the 1930s, and more so during the post-World War II aftermaths of a certain radically empiricist influence on scientific practice. The latter has been a practice typified by what has become known as the Cambridge Systems Analysis school of the followers of not only the eccentric Ernst Mach, but, most emphatically, Bertrand Russell et al., as, for example, at the Laxenberg, Austria International Institute for Applied Systems Analysis (IIASA).

The topic of this report is, that the piece by Woese et al., referenced here, with its otherwise commendable emphasis on dynamics, errs in one important feature of *method*. It errs by seeking to argue the arguments bearing on matters of physical principle, within an implicitly hostile set of currently hegemonic statistical methods; they have apparently overlooked some essential matters of principle, principles which, however, stand outside the territory in biology staked out by them for the purpose of their report.

Therefore, my criticism here is not focussed upon the details of their reports on experimental findings within their implicitly assumed choice of sub-domain of the biology of living processes as such. My attention is focussed here on *principles which they do not bring into play*. They do not confront the problematic features which arise in any effort to build arguments in which it is presumed, implicitly or otherwise, that the role of mankind within biology, must be bounded by a certain commonplace assumption respecting statistical method of practice. It is also crucial that they omit the relevant issues of the ironical nature of the reciprocal interrelationship between, and interaction of the Biosphere and Noösphere. For my purposes, those omissions tolerate a mistaken presumption, a fallacy of composition, the assumption, which I believe is contrary to their intention, that scientific knowledge may be permitted to be built up in proofs which proceed from unproven, merely *a prioristic* presumptions, such as those underlain by the persisting influence of Euclidean and Cartesian geometry upon widely employed statistical methods.

This might be mistaken by those authors for "nit-picking" by me. It is not, as the unfolding of my argument here will show.

The typical such mistaken presumption is, that the build-up of knowledge must occur, statistically, through a succession of, first, the chemistry of non-living processes, second, then continued through the domain of the Biosphere, and, thence, continued by implication, into, third, the uniquely specific *differentia* exhibited by the human species. My approach proceeds, as I show here, in the opposite direction: from the Noösphere, downward, to the Biosphere, and, thence, to, statistically, the relatively simplistic, subsumed, reductionist's view of the Periodic Table of elements and their isotopes.[2]

Unfortunately, today's prevalent use of statistical method of interpretation of evidence itself, which I challenge here, has tended to be taken in the usual practice of that profession as some magical authority over nature, the authority of that statistical mysticism inherent in *a priori* mathematical methods, such as those of those reductionist forms of Sophistry known as Euclidean and Cartesian geometry.

Worse, today's practice is usually dominated by that axiomatically irrationalist doctrine of modern philosophical Liberalism which is derived from the precedent of the medieval irrationalist William of Ockham. I refer, with emphasis, to the continuing, hereditary influence of the doctrine of the founder of modern European Liberalism, Paolo Sarpi. This is what was established in the form of what became Anglo-Dutch Liberalism and its impact on practiced scientific method, as by Descartes, de Moivre, D'Alembert, Leonhard Euler, and Joseph Lagrange. Even worse, today's practice is dominated by the radically positivist versions of that Liberalism, the degenerate form associated with the emergence of the successive influences on the subject by Ernst Mach and Bertrand Russell on mechanics, and by the even more radical extremes of Russell's ***Principia Mathematica***.

If there is one most crucial fact shown by science to date, it is that the universe is neither Euclidean, nor anything resembling that.[3] I protest against the use of a perverted notion of what are inherently arguments premised upon presumptions of an *a prioristic,* digital statistical consistency, arguments derived from such arbitrarily chosen ideological origins, and then employed without regard for the bias expressed by those assumptions, which, in turn, are adopted as a standard for "objectively" interpreting physical-experimental evidence. This is typified by what is, presently, the greatest, most prevalent, single ideological barrier to academic or comparable progress in scientific thinking and in crafting economic policy today.

### My Method in Physical Economy

My principled approach to the subject which I present here, addresses the fallacies inherent in the use of the inherently reductionist, so-called statistical methods, as, most emphatical-

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2. Distinguishing those isotopes of the table which are tuned specifically to living processes.

3. Cf. Lyndon H. LaRouche, Jr. "My Early Encounter With Leibniz: On Monadology," LPAC, Jan. 22, 2008. Also in *EIR*, Feb. 2, 2008.
———"A Strategic Economic Assessment: That Doomed & Brutish Empire," *EIR*, March 14, 2008.

ly, when such methods are used in treating *the subject of what is the inherently willful characteristic of that which drives human behavior,* as if the lack of those relevant distinctions respecting the role of human behavior might be an appropriate omission in any treatment of other, lower types of living processes.

*The most important feature of anything when it is first encountered, is what it is not.* Thus, the effect of the omission of the Noösphere's indispensable authority for defining the subsumed Biosphere of today, is the problem which, for example, threatens the referenced line of work by Vetsigian, Woese, and Goldenfeld. On this account, I define the proper choice of method in *any* competent branch of practice of physical science itself, as in the special branch of physical science represented by the subject of economy, as reflecting a *willful* treatment of the relevant subject-matter from the standpoint of *willful human* behavior, on the presumption that such subjects cannot be simply predictable in categorically statistical (e.g., *a priori*, as in Euclidean) or similar ways.[4]

Since the time of the discovery, by very ancient celestial navigators, of that power for change of the stellar universe, which is therefore the intrinsic power defining the reality within which we dwell, we must recognize that any branch of competent science, since actual science was developed out of the practice of celestial navigation, has always been *the practice of the continuing of that process of discovery; thus, there is the discovery of those principles whose process of accumulation implicitly defines the mind of the human individual*. In other words, to sum up the conclusion to which those considerations must lead us: we must proceed in today's science from the generative, Riemannian standpoint of V.I. Vernadsky's *Noösphere,* downwards, which are the true fundamentals, toward the functionally subsumed subjects of the Biosphere and inanimate nature.

So, from this standpoint, we should situate the treatment of sub-human biology, the Biosphere, under the higher authority to which it is subject, a higher authority which exists

*William of Ockham (1287-1347)*

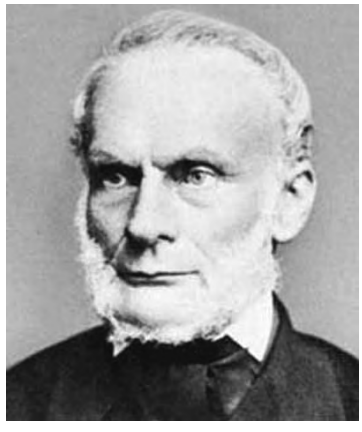
Engraving by George Vertue, 1736

*Paolo Sarpi (1552-1623)*

*René Descartes (1596-1650)*

*The founders of modern philosophical Liberalism and the later practitioners of radical positivism exemplify the reductionist, statistical approach that is crippling scientific thinking and economic policy today.*

*Hermann Günther Grassmann (1809-1877)*



*Rudolf Clausius (1822-1888)*

4. Hence, the intrinsic folly in method which underlies the habitual failures of the prevalent types of economic statistical forecasters.

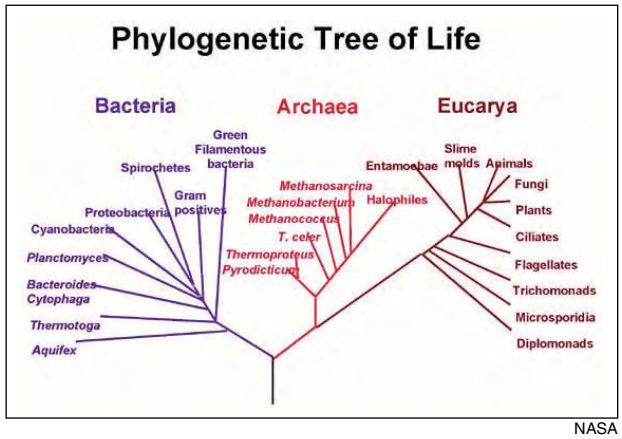
# Carl Woese and His Work

Dr. Carl Woese, microbiologist at the University of Illinois, is best known as the discoverer of the Archaea (ca. 1978), a type of organism including methanogens and other extremophiles, which, he saw, were not bacteria. Woese's discovery was at first bitterly opposed by such leading figures in biology as Salvador Luria and Ernst Mayr.

Woese pioneered the classification of organisms by biochemical signatures of the DNA, attempting to supersede the old classifications based largely on visual morphologies. Yet, his writings since 1965 show him to be a consistent opponent of the reductionism of molecular biology.

Bill Weigand/UIUC

*Microbiologist Carl Woese*




NASA

*Woese proposed three Domains, taxonomically above the Kingdoms: Procarya (which includes the bacteria), Archaea, and Eucarya.*

In 1990, Woese proposed a new taxonomy. By then, the kingdoms had grown to five: Plant, Animal, Protists, Monera, and Archaea. It was an inconsistent mixing of the earlier taxonomies, based on visual and microscopic morphologies, with the biochemical and electron microscopy. Woese proposed, as a remedy, to create three Domains, taxonomically above the Kingdoms. These are Procarya (including bacteria), Archaea, and Eucarya. The first includes the bacteria, the second the very different Archaea, and the third the plants, animals and fungi, which share common traits and presumed lineage at the biochemical level.

Woese went on to develop his ideas of evolution of organisms, not from a unique common ancestor, but rather by a process he called horizontal gene transfer occurring in a communal living process that had little or no species individuation. The excerpt from the 2006 paper below summarizes that notion. —*Laurence Hecht*

## Excerpts from Woese, et al. on Collective Evolution*

The genetic code could well be optimized to a greater extent than anything else in biology and yet is generally regarded as the biological element least capable of evolving. There would seem to be four reasons for this paradoxical situation, all of which reflect the reductionist molecular perspective that so shaped biological thought throughout the 20th century.

First, the basic explanation of gene expression appears to lie in its evolution, and not primarily in the specific structural or stereochemical considerations that are sufficient to account for gene replication.

Second, the problem's motto, genetic code, is a misnomer that makes the codon table the defining issue of gene expression.

A satisfactory level of understanding of the gene should provide unifying account of replication and expression as two sides of the same coin. The genetic code is merely the linkage between these two facets. Thus, and thirdly, the assumption that the code and the decoding mechanism are separate problems, individually solvable, is a reductionist fallacy that serves to deny the fundamental biological nature of the problem. Finally, the evolutionary dynamic that gave rise to translation is undoubtedly non-Darwinian, to most an unthinkable notion that we now need to entertain seriously. . . .

To this point in time, biologists have seen the universality of the code as either a manifestation of the Doctrine of Common Descent or simply as a frozen accident. . . .

Our point of view alleviates the need for any assumption of a unique common ancestor. We argue that the universality of the code is a generic consequence of early communal evolution mediated by HGT [horizontal gene transfer], and that HGT enhances optimality. . . .

If Darwin had been a microbiologist, he surely would not have pictured a struggle for existence as red in tooth and claw. Our view of competition in a communal world as a dynamical process is very different from the widely understood notion of Darwinian evolution. Survival of the fittest literally implies that there can only be one winner from the forces of selection, whereas in a communal world, the entire distributed community benefits and its structure becomes modified by the forces of a selection that is an inherently biocomplex phenomenon involving the dynamics between the community elements and the interaction with the environment. . . .

* Kalin Vetsigian, Carl Woese, and Nigel Goldenfeld, "Collective Evolution and the Genetic Code," PNAS (*Proceedings of the National Academy of Science*), Vol. 103, No. 28 (July 11, 2006), pp. 10696-10701.

only in the relatively higher realm of the Noösphere. As I show in this report, it is those features of the Noösphere which are lacking in the Biosphere, which should be the preferred choice in defining the principles within which existence of the Biosphere *is situated ontologically*.

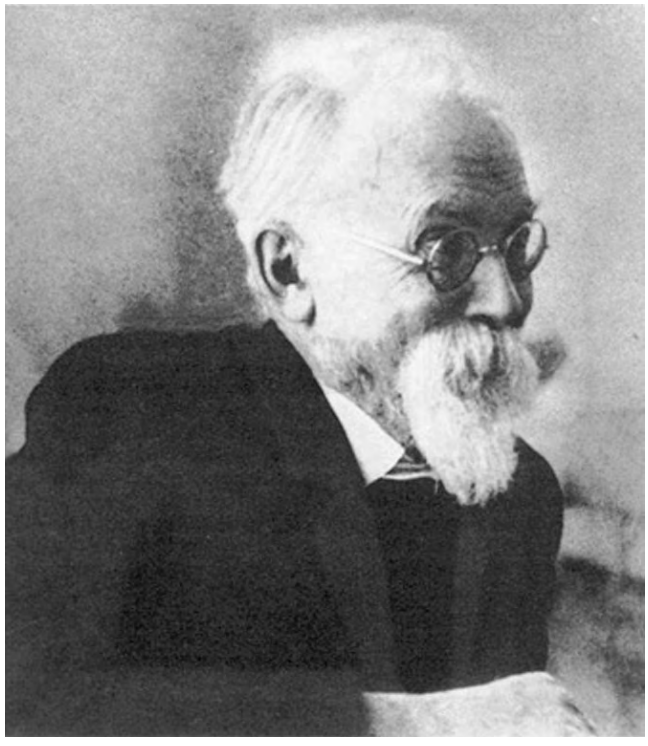
Therefore, I point to such examples of mistaken approaches, as are typified either by the denial of an efficient universal physical principle of life *per se*, as by radical positivists and their like, or, by the comparable attempt to adduce the origins of the cognitive powers specific to mankind from the biology of animal life.

Today, those who have actually grasped the higher order of meaning which permeates the specifically human process of successful discovery, know that universe to be, in principle, as Leibniz argued for a universal physical principle of least action, and as Albert Einstein, similarly, recognized the universe to be: *a dynamic, analog form of Riemannian universe, not a neo-Cartesian statistical (digital) universe*. Contrary to the hoax of the famous "Second Law" of Clausius, Grassmann, Kelvin et al., ours is a universe which exists, for our powers of discovery, as a boundlessly finite universe, *a self-contained, anti-entropic, universal process of continuing creation*—as the famous aphorism of Heracleitus claimed.

This is the same point which was *exemplified, for us in modern European civilization, as Einstein emphasized the exemplary significance of Kepler's uniquely original discovery of gravitation, by a succession of discoveries of universal principles which are, each and all, typified by Johannes Kepler's uniquely original discoveries founding the science of modern astrophysics.*[5]

Therefore, the encompassing premise in my argument bearing on the referenced aspect of the work of Woese et al., is not only located within Academician V.I. Vernadsky's uniquely original discovery of a universal physical principle known as the Biosphere, but also in Vernadsky's associated recognition of the existence of the Noösphere as being, also, a strictly dynamic, distinct universal phase-space, which is also to be defined experimentally in Riemannian terms. In addressing matters of living processes, the emphasis is upon the precedents of physical chemistry treated by the Riemannian method adopted by Academician V.I. Vernadsky; as I have shown successfully for a science of physical economic forecasting, which are the same Riemannian principles, of the Noösphere.

It may appear to some that the Noösphere is a product of the Biosphere. True, the Biosphere loans material to the Noösphere, and vice versa; but, it is the Noösphere which contains, and acts upon the Biosphere. It is the Noösphere which transforms the Biosphere, not only in materials, but in what the Noösphere compels the Biosphere to contain, or to produce, by both deductions and additions to the repertoire of the Biosphere's substance and action.



*Russian-Ukrainian scientist Vladimir I. Vernadsky (1863-1945) defined his conception of the Noösphere in Riemannian—not statistical—terms. Science must proceed from this standpoint downward to the subsumed subjects of the Biosphere and inanimate nature.*

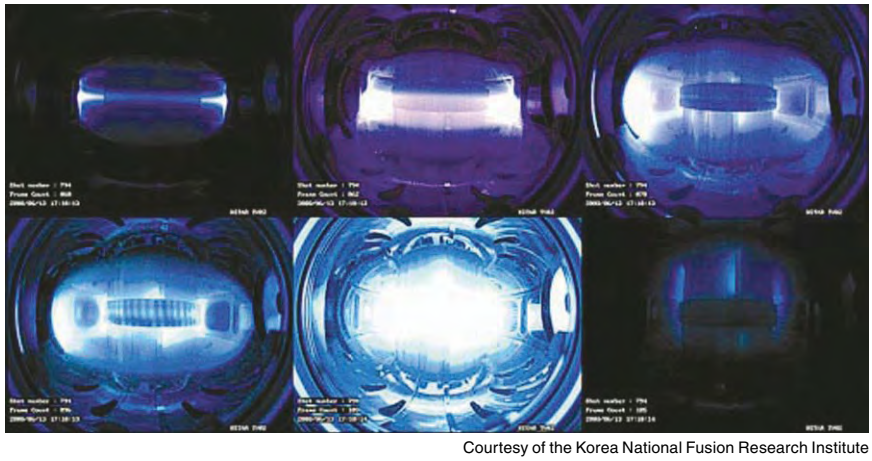
Thus, my own contribution to that latter array, is to be found in my premising an actual science of physical economy, the standpoint which I have employed for the special case of long-range forecasting and related purposes, since the late 1950s, on those same implications of Bernhard Riemann's argument which were first boldly stated in their core in his 1854 habilitation dissertation.[6] My own views on the significance of Riemann's work for physical economy, views which were outgrowths of a notion—a "spark"—discovered by me to this effect in 1953, have continued to be the foundation, since that time, for my original

5. As I have pointed out in various earlier locations, the idea of science, such as the Egyptian-Pythagorean practice of *Sphaerics*, is derived from *that notion of universal* which, as a concept, has depended upon a very long span of empirical development of calendars derived from the cumulative evidence of very many generations of development of long-ranging celestial (oceanic) navigation by maritime cultures, as under the conditions of the approximately 200,000 years during which glaciation dominated large portions of the Northern Hemisphere, a glaciation toward which Earth is signaling a threat to return now.

6. The principal such distractions from this fact of Vernadsky's originality are to be found in the kinds of misguided, "fundamentalist" or kindred religious fervor, notably those forms which adopt either the dubious speculations of the "Piltdown" co-hoaxster and reductionist mystic Teilhard de Chardin, or, what are clearly recognizable elements of the ancient pagan's Delphic cult of Gaea, in seeking to bring the mighty Creator of the universe down to Earth, so to speak. Teilhard's relevant work touches, if only deceptively, upon the names of valid conceptions, that to such effect that the errors of many of his putatively more orthodox critics are worse mistakes than his own. It is in the systemic features of his applications of his conception of noësis, that the essential error of his explanations is more clearly shown. The source of the confusion lies in Teilhard's attempt to reconcile the idea of creativity with what is called, unfortunately, a "Classical" Christian doctrine, where the attractive aspects of his work appear; his attempt to reconcile that with an axiomatically reductionist (i.e., Aristotelean or quasi-Aristotelean) form of cosmogony, is the root of his confusion. Teilhard's minting of the term "Noösphere" was acknowledged by Vernadsky; Teilhard named the baby, but Vernadsky conceived and delivered it.


Michel Maccagnan/GNU

*In a typically human willful act of seizing "fire" from the Olympian Zeus, South Korea's KSTAR (Korean Superconducting Tokamak Advanced Research), intends to establish the scientific and technological basis for a future power-producing fusion reactor. KSTAR produced its first fusion plasma in July 2008, as seen below.*



Courtesy of the Korea National Fusion Research Institute

1950s development of a science of physical-economy, a branch of science which is in the continuing tradition of Leibniz's emphasis on dynamics, as opposed to Cartesian and related methods. This is, thus, a continuation of work of founding of a physical science of economy, as accomplished by Gottfried Leibniz over the course of his relevant work during the span of 1671-1716. This method has been the basis for what has proven to be, uniquely, a, happily, virtually faultless series, of superior quality, of long-range economic forecasts, that since the late 1950s.

The crucial, and pivotal fact on which my own discovery in this matter depends, is expressed in a specifically dynamic manner (i.e., analog: Leibniz-Riemann), as distinct from wrongly assumed digital (e.g., Euclidian-Descartes) characteristics of human potential population-density, *as, thus, absolutely distinct in effect from the concept of ecological potential population-density expressed by lower forms of life*. The human individual is potentially, uniquely capable of re-inventing the human species in a qualitatively more advanced form of functioning, through transcendental, qualitative up-shifts of a Classical mode in the potential relative population-density of the human species.

Thus, the shifting dependencies of the ascending quality of economies, successively, from burning of wood, of coal, of petroleum, of nuclear-fission power, and upwards, typify characteristic, phase-space stages of successive, upward evolution of human cultures, a willfully driven, qualitative development of the species of action which does not occur in any merely ordinary living species. It is man's seizing knowledge of that "fire" which Olympian Zeus forbade be given to mankind, which defines the human species in its true distinction from all lower forms of life.[7]

7. Aeschylus, *Prometheus Bound*, line 7, παντέχνου πυρὸσ σελασ, which Herbert Weir Smyth translates: *flashing fire, source of all arts*.

In other words, the actual existence of the human species, with its characteristic form, as *dynamic*, is derived from a specific (i.e., *noëtic*) quality of the human mind, a quality which does not exist within any lower form of life (e.g., in the Biosphere). The principle of human life neither exists in lower forms of existence than that, nor can it be derived from studies of the non-human, as if "pre-human," aspects of the Biosphere. The Biosphere generates the potential for effective action by the Noösphere; but, the realization of such potential occurs only within the Noösphere itself.

Focus upon the fact that the increase of the absolute magnitude of the proportions of the composition of the Earth's mass represented by the combined Biosphere and Noösphere, as a percentile of the total mass of our planet, when this is considered in light of the evidence that the Noösphere is expanding more rapidly than the Biosphere as such, indicates the existence of a universal physical principle, the cognitive powers of the individual human being, which is not willfully expressed in any lower form of life than the human individual.

The included point here, as it is amplified in the subsequent chapter of this report, is that the principled character of the Biosphere's function is itself transformed qualitatively by the action of the Noösphere, such that the Biosphere no longer has fixed sovereign characteristics, because those characteristics themselves are being continuously transformed by action of the Noösphere. This pertains not merely to the array of elements of which the Biosphere is composed, but to the principles which generate the selected elements, both old and newly created, of the Biosphere's evolution under the reign of the Noösphere. The evolution of isotopes, their roles, and their relative quantities, as with those of specific importance for living processes, as through the role of nuclear-fission of late, could not occur otherwise.

That distinction, is what is to be called the function *of human potential relative population-density, as increased per-square centimeter of cross-section of mode of power employed, drives a (potential) per capita and per square kilometer increase of potential human occupation of a large territory (or, of a continent or of the planet as a whole)*. This fact is relatively obvious to even merely competent modern studies; but, the way in which this effect is generated, takes us outside the bounds of the way the topic of "scientific method" as such is usually visualized in today's classroom and elsewhere. The crucial point to be emphasized, is: *the Noösphere is derived from a universal physical, cognitive principle of human life, a power of organization which does not exist within the species of the lower forms of life, such as the higher apes.*

The progress of the human species, relative to other species, lies in a principle which is characteristic of the human species, but not others. Therefore, rather than the "bottom upwards" habit of attempting to obtain the transition to a relatively higher *cardinal* state of a multi-phase-space process, such as attempted transition from abiotic to Biosphere, or Biosphere to Noösphere, we must *not* proceed in terms of the factors of the previously existing (lower) state; rather, ***we must treat the "teleological" transition as effected by action as if bestowed from the higher state upon the relatively lower one*** as Vernadsky emphasized the ordering of the relative mass of the abiotic, Biosphere, and Noösphere. In other words, *the form of increase of the potential relative population-density of the human population, has the (dynamic) mathematical-physical form of the pre-determination of the present potential by types of changes (as by human discovery of a higher principle) which correspond to what had been introduced as a* ***future*** systemic level of potential, rather than something manifest as a statistical determination of a future state, as a consequence of a current one.

The development of this potential in the human species, determines the effect of that upon the entire domain of the Biosphere. And, so forth, and so on.

I explain the significance of this phenomenon.

**Carl Woese et al.**

Therein lies the essence of my original discovery in the domain of a science of physical economy. However, my discovery is not merely that; there are much more profound implications of this, implications which should not be overlooked in an appropriate re-reading of relevant features in the identified work of Carl Woese et al.

It will be clear to those associated with the work of Carl Woese et al., that my choice of reference to their work in making the crucial point presented here, was prompted by my satisfaction with the dynamic implications of such passages in the referenced work as: "... Specifically, we will herein model the evolution of translation, the codon table, the constraints therein, the universality of the code, and the decoding mechanism, not as a sum of parts but as a whole. ..." In other words, *dynamics*, as defined by Leibniz against Descartes, and, defined later, by Riemann.

So far, so good; that is consistent with Riemannian dynamics. However, the question remains here: what is the organization of the whole process of development which accounts for the efficient, *actual* generation of *qualitatively* higher orders of dynamic states—higher states on principle, such as the fact that the human being represents a higher quality of principled physical state than any lower form of life?

The idea of the need to discover a solution for that question, is readily seen to be expressed in the upward evolution, as through realized application of higher physical principles, in physical-economic processes. The latter are, of course physical-economic processes, but those examples can not be other than crucially relevant for understanding other dynamic models of living processes, or the effects of human physical-economic evolution upon the two lower phases of our planet's internal processes.

The answer, in the case of "social" models, as distinct from the organization of behavior in the animal kingdom (as with models such as mankind living within Kepler's astrophysics), is that *the universe is intrinsically anti-entropic*, contrary to the Clausius, Grassmann, Kelvin cult of a "second law of thermo-

Remy/swiss-image.ch

*Al Gore personifies the Malthusian, fascist political intent behind the "Global Warming" fraud. Its acceptance depends upon a population not using the higher cognitive functions that distinguish human from animal behavior.*

dynamics." However, as Vernadsky's work has forced the fundamentally principled distinctions among the abiotic, the Biosphere, and the Noösphere to our attention, there are qualitative distinctions of universal principle among those sectors of the universe to be taken into account. As the history of the changes in relative mass of abiotic, Biosphere, and Noösphere components of the upper regions of Earth show, entropy, as a phenomenon, is a subsumed expression of the superior influence, anti-entropy, within which the apparent entropy appears, and under which it must be defined. *Before there could be death, there must, first, be life.*

The conclusive argument to such effect, is located in the case of mankind's increase of the potential relative population-density of human populations, which is accomplished only through those noëtic processes of discovery of higher order physical and kindred, Classical artistic, principles, processes which echo the process of creation typified by Johannes Kepler's uniquely original discovery of the role of gravitation in the ordering within the Solar System.

The human being is distinguished from any animal species by the set of relationships defined as a reflection of its twofold characteristic. On the one hand, it has a body, like that of an animal; at the same time it is an absolutely different form of existence than any of the great apes, which are mammals, by the existence of a human mind which is not located within the confines of the apparent mental life of an animal. This distinguishing difference is conveniently identified as the human "spirit" or "soul," which has none of the characteristics of any known form of animal life, except as animals develop as appendages of mankind.[8]

Yet, a naive use of the term "spirit" or "soul" not only misses the crucial point, but has promoted widespread, absurdly mystical speculations. The human "soul" is very much an efficient part of the physical universe, that in the sense of the famous ***Genesis*** 1, but not as the term "physical" is still customarily employed in reductionist terms of reference. That "soul" is the actual personality of the human individual, that in the sense provided by Plato. It is an expression of an efficient phase-space within the universe at large, and expresses, in the guise of the Noösphere, a human individual's power to change that universe willfully.

The biological domain, the domain of the Biosphere, is contained within, and is subordinate to that Noösphere. This is to be understood as the expression of the Noösphere's power to contain and modify the characteristics of the Biosphere. With mankind's appearance, the Biosphere thus loses its independent functional characteristics (if, indeed, it ever had them); the Biosphere becomes, in every way, a phase-space contained within the Noösphere.

Therefore, we treat the subject of the Biosphere here in those terms of reference. We present the case to be argued here by the method of successive conceptual approximations.

That, so described thus far, is my subject here.

## 1. The Relevant Fallacy of Sense-Certainty

The crucially distinct feature of human behavior is, that, unlike animal behavior, human behavior is inherently *not* subject to the conceptual approach inhering in presently conventional ranges of today's proffered statistical-ecological models. Nor is animal behavior ordered in a way which is independent of the effect of changes in the higher, human, reign of the Noösphere. It is also fair to say that "choices" of animal behavior are, relatively speaking, "event-driven," where the crucially important, higher cognitive functions of actually intelligent, as distinct from "knee-jerk" practices among human beings, are concept-driven,

8. I address this, and Cusa's treatment of the same subject, within part of chapter 2 of this report.

rather than "event-driven."[9]

Therefore, the way to design the lure for an animal, or a foolish U.S. voter, to bring about that individual's contribution to its self-inflicted ruin, is to rely on the intended victim's behavior being "event-driven" (e.g., "fact-driven") as, for example, the pathetic credulities of believers in "Malthusian" models, such as the "Global Warming" hoax. Otherwise, what is typical of intelligent human behavior, especially creative-scientific or Classical-artistic behavior, is "teleologically"-driven human creative insight, in the sense of a Classical (e.g., Platonic) form of *hypothesis*.

To the extent that human populations may, at some time, seem to show relatively fixed (e.g., "traditional") ecological potentials, apparently like those which might be attributed to be characteristic of animal populations, such as knee-jerk proposals for the fraudulent, Malthusian policies of former Vice-President Al Gore, et al.: such decadence by the Malthusians and their present-day "Global Warming" frauds, is itself evidence that the related cultural matrix of that inherently stagnating society which such frauds as Gore's express, is inherently an abnormal (i.e., pathological) model, one specific to that half-witted trend within the relevant part of the general population.[10] Whereas, a healthy organization of society is not a fixed system, but upward-evolutionary (e.g., increasing potential relative population-density), and, thus, committed to scientific, Classical-cultural, and technological progress for its own sake.

Thus, speaking parenthetically, since, as I have already emphasized here, the Biosphere is bounded systemically by the Noösphere, the crafting of the environment through the evolution of the Noösphere, shapes the selected course of regulating both the external boundaries and internal development of the Biosphere (defines the changes in rules). This functions to the effect *that the dynamic "forces of evolution" within the Biosphere, are not independent of the Noösphere; but, are themselves shaped by the development in the Noösphere.*[11] Thus, it is essentially an error to attempt to develop a simply biological model for the Biosphere as such, even a truly dynamic one: thus making the error of assuming that the higher, controlling force of the Noösphere were not the increasingly significant source of the conditions to which the evolutionary (Riemannian) dynamic of the physical geometry of the Biosphere is subject.

Painting by Heirich Fueger, 1817

*Prometheus bringing fire—the knowledge of universal physical principles—to mankind, a "crime" for which he was punished by the Olympian Zeus*

For example, consider some relevant history:

### The Decadent Olympian Model

In the history of the ancient through modern cultures gathered around the Mediterranean Sea, the culture of typical cases of stagnating, or degenerating societies, is typified by the model depicted by the "zero growth" policy expressed by the character of the Olympian Zeus, of Aeschylus' ***Prometheus Bound***. Under Zeus' inhuman, tyrannical policy of zero-technological growth, the ordinary people, like the helots of Lycurgus' Sparta, or the neo-Malthusian dupes of the U.S.A. and Europe since 1968, are forbidden access, if only ideologically, to the possibility of the gaining of knowledge of universal physical principles (e.g., "fire," nuclear-fission power, etc.). The effects of an implicitly neo-Malthusian cultural pathology of those who can be defined ideologically as "68ers" and their dupes of younger generations, are typified by the archetypical case of Aeschylus' account of the evil of the Olympian Zeus, an Olympus which is a model case

9. Concept-driven" as in recognition of a relevant principle of nature, or of current social processes. Thinking which walks in the footsteps of the discovery of universal gravitation by Kepler, Fermat's discovery of the principle of least action, Leibniz's uniquely original (e.g., 1676) discovery of the principle of the calculus, or Riemann's 1854 habilitation dissertation.

10. It is fair, and necessary to say that former Vice-President Al Gore's "global warming" hoax, is essentially a fascist economic model in the footsteps of the Haileybury Society's Thomas Malthus, Mussolini, and Hitler, or, the Olympian Zeus of Aeschylus' *Prometheus Bound*, or Friedrich Nietzsche's dogma, since the model could not be institutionalized as a national, or world system except by what are easily recognized as fascist political means. Thus, essentially, like the H.G. Wells who stated his fascist commitments openly, Wells' accomplice, Bertrand Russell, was even more frankly, rabidly fascist than a Mussolini or Hitler.

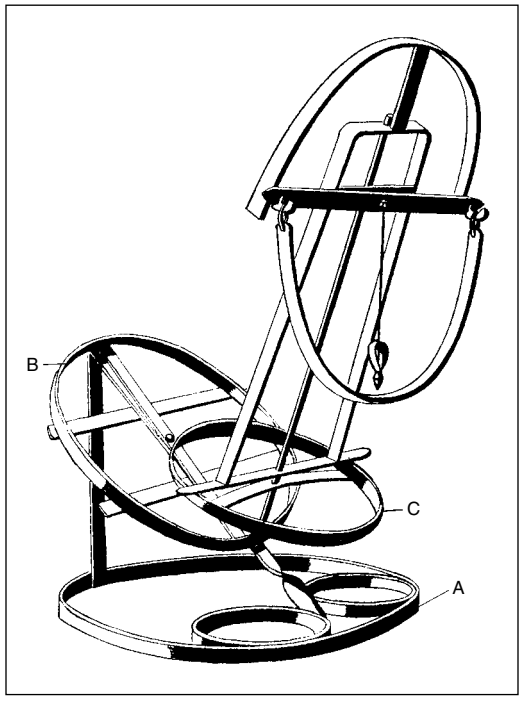
11. Compare the case of the displacement of marsupials by arriving mammals, as the Australian "historical" model attests. While kangaroos, for example, may persist, most of the marsupials are replaced, niche by niche, by placental types which caricature the marsupial types. Leaving such oddities as the Platypus and a certain well-known, large-pouched publisher lingering as leftovers from the set of egg-laying species.

which becomes, thus, key for understanding both the characteristic systemic-cultural problems and the origins of these problems which have been the continuing threats to civilization from within modern trans-Atlantic culture itself.

For example, in the so-called "code" of the Emperor Diocletian, who crafted the political system from which the Byzantine Empire emerged, the rich and powerful lusted and reveled, while the mass of the thus degraded population knelt, and accepted a quasi-"Malthusian" social system of what was virtually "zero technological growth." This set the pattern for serfdom, or worse, as a system. This affected the development of the organized behavior of that society as a system. That, in turn, generated an effect, which, in turn, made the factually obvious, implicit rules for dynamic "channeling" of the *self-evolution* of the Biosphere in that phase of the planet's life.

This model of Diocletian and his successors, was a variant of the Delphic model of Lycurgus' Sparta. It had been, and remained a variant of what was known as the "oligarchical model," a Delphic model which had been temporarily defeated by Alexander the Great, but was to be established, under the hegemony of the murdered Alexander's Ptolemaic successors, up into what was to emerge later as the rise of the process leading into the process of formation of what was on the way to becoming the Roman Empire from about 200 B.C.,[12] and would be continued, in principle, in Europe and adjoining regions of west Asia under the Byzantine system, and under the still worse, successor system under the hegemony of the Venetian financier-oligarchy and its instrument the Crusading Norman chivalry.[13]

*An Egyptian ship depicted in the Tomb of Menna, ca. 1422-1411 B.C.) Actual science developed out of the practice of ancient celestial navigation.*




Drawing by Matt Makowski in *The Epigraphic Society Occasional Publications*, Vol. 32, No. 29, Feb. 1975

*Sketch of a brass model of an ancient tanawa, or calculator, made from a drawing on a cave wall in Sosorra, Irian Jaya (West New Guinea), around the year 232 B.C. The base (A) in the plane of the observer's horizon, is oriented so that the axis of symmetry is parallel to the meridian. (B) is the equatorial plane. (C) is the ecliptic plane. The Renaissance tanawa was known as a torquetum.*

The principal exception to that oppression, is to be seen during the reign of Charlemagne; the death of Charlemagne opened the way for the hegemony of the system of domination by (temporarily) a decadent Byzantium, and, then, later, the imperial Venetian financier-oligarchy with its chronically crusading Norman instruments.

Looking more deeply into these chronic problems of the presently continuing European form of the oligarchical model, the pro-oligarchical model of most of the reigning local governments centered on the Mediterranean, most of the time, we have the following notable points of relevant emphasis bearing on the

12. The deaths of the celebrated correspondents Eratosthenes and Archimedes, marked the onset of a clearly marked decline in European culture in the period beginning the Roman victory in the Second Punic War.

13. It is notably relevant, that the ancient Greek model of later European imperialist designs, is to be seen, to modern times, at the existing site of the Delphic cult of Apollo-Dionysos. Arrayed around the site of the temple itself, there are "chapels" representing the treasuries of ancient Grecian cities. Following the path downhill to the relevant nearby port location, we recognize the ancient Delphic model for not only the Lombard League of European "New Dark Age" notoriety, but the presently posed renewal of a proposed world empire of city-state usury proposed by those who, today, demand the form of globalization proposed by such creatures as that self-proclaimed, Forty-Billion-Dollar fossil, New York Mayor Bloomberg.

external conditions affecting the evolution of the human parameters of the Biosphere itself.

**Celestial Navigation**

What became known as European culture was rooted in a widespread maritime culture dated from deep within the last great age of glaciation, so far, in the Northern Hemisphere. The leading cultures emerging in the historical Mediterranean from that time, were maritime cultures, cultures whose more or less remote ancestors had (apparently seasonally) migrated across very long distances, and did so continuously over many thousands of years. The practice of navigating by study of the differentiated pattern shown by the Sun, Moon, Planets and Stars, sailing by the stars, has been the obvious root of the proper use of the term "universal," the only valid meaning of "science," especially as this term is to be applied to physical science, especially as this was defined for modern times by the manifold role of Cardinal Nicholas of Cusa in launching the modern history of European civilization with the Fifteenth-Century Renaissance, and with the prompting by Cusa's testament, of Christopher Columbus's famous first trans-Atlantic voyage of discovery.[14]

14. It was Nicholas of Cusa's proposal for trans-oceanic development of contacts of Europe across the Atlantic and into the Indian Oceans, which explicitly guided Christopher Columbus's scientific knowledge of the feasibility of crossing the Atlantic. Columbus acquired this knowledge through a reading of the testament of Cusa, which was lodged with the executor of Cusa's testament resident in Portugal at that time. Approximately two decades later, Columbus succeeded in fulfilling that intended design by Cusa.

Much of the experience from that long period of glaciation and the earlier portions of its aftermath, remains to be defined. Yet, it remains increasingly clear, that the great floods and ancient rivers flowing from the melting of the glaciation correspond to a period, since about 17,000 B.C., since which the levels of the oceans had risen, by about 2000 B.C., by about 400 feet. However, what is clear about the outcome of this change, is the still visible evidence, today, of the role of oceanic maritime cultures in colonizing areas often fortified against the populations of the nearby interior. To be brief, here, this led into a period, during the Seventh Century B.C., when the Etruscans, Ionians, and Egypt (e.g., Cyrenaica) became allies against the tyranny of Tyre. This development, based chiefly on a renaissance in Egypt of that time, defined the process of synthesis which formed the root of European maritime culture, and the subsequent development of European civilization.

The crucially relevant point on which I am focussed in these references to such historical matters here, is that it was the trans-oceanic maritime cultures, the cultures reflected in the great discoveries of Johannes Kepler, which had discovered the secrets of celestial navigation; but, these cultures had tended to degenerate into a form of oligarchical rule over the strains of human population from inland regions.

There were, in fact, two principal strains of oligarchical culture affecting the Mediterranean from historical times. One, emphatically land-based, and principally a reflection of emerging cultures of the Asian interior, and the other, the Mediterranean-

## Einstein on Kepler

*These are excerpts from an essay by Albert Einstein, in commemoration of the 300th anniversary of Kepler's death. It appeared in the* Frankfurter Zeitung *on Nov. 9, 1930.*

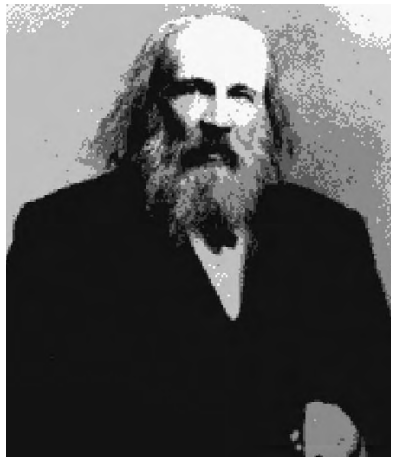
In anxious and uncertain times like ours, when it is difficult to find pleasure in humanity and the course of human affairs, it is particularly consoling to think of the serene greatness of a Kepler. Kepler lived in an age in which the reign of law in nature was by no means an accepted certainty. How great must his faith in a uniform law have been, to have given him the strength to devote ten years of hard and patient work to the empirical investigation of the movement of the planets and the mathematical laws of that movement, entirely on his own, supported by no one and understood by very few! . . .

One can never see where a planet really is at any given moment, but only in what direction it can be seen just then from the Earth, which is itself moving in an unknown manner around the Sun. The difficulties thus seemed practically unsurmountable.

Kepler had to discover a way of bringing order into this chaos.

*Max Planck (left) gives a medal to Albert Einstein in Berlin, June 28,*

*Louis Pasteur (1822-1895)*



*Dmitri Mendeleyev (1834-1907)*

*The principled physical distinctions among the distinct phase-spaces of the abiotic, Biosphere, and Noösphere "are to be located systemically (experimentally) in their common domain, that of the practice of physical chemistry in the footsteps of those such as Louis Pasteur, D.I. Mendeleyev, William Draper Harkins, and Vernadsky."*

*William Draper Harkins (1873-1951)*

centered maritime culture. During the interval following the Peloponnesian War, during the adolescent and adult life of Alexander the Great, the two systems of oligarchical rule, the Mediterranean and Asian, were fused to form what has been the generic form of the European cultural oligarchical model of medieval and modern times, that typified by the financier-oligarchical rule of the British Empire of today.

Thus, with the late Sixteenth, and Seventeenth-Century triumph of the new Venice faction of Paolo Sarpi and his followers over the pro-Aristotelean old-Venice faction, the defeat of the continental European powers in the wars of France's Louis XIV, through the February 1763 Peace of Paris, brought about the emergence of the Anglo-Dutch Liberal faction of Paolo Sarpi's heritage, as the hegemonic, oligarchical form of imperial maritime culture, chiefly Anglo-Dutch Liberal financier-imperialism, of Europe and most of the world beyond, during most of the time since that point. The emergence of the U.S. Federal republic as seen in admiration for U.S. President Franklin D. Roosevelt, from among many nations, is what is to be seen as having been the principal design for a successful challenge to Anglo-Dutch global imperialism since that time, to the present date.

### The Ontological Infinitesimal

For the subject of this present report, which is essentially a matter of physical science, more than politics otherwise, the relevant pro-Classical argument can be fruitfully selected and adopted from the treatment of that kind of distinction between "naturally" and socially generated catastrophes, as proffered by Plato in his ***Timaeus***. For the purpose of this present discussion, I focus attention on the effect of catastrophes induced by a failure of a society to progress in ways which, at the least, overcome the attrition inherent in any, scientifically, "zero technological growth" system, that through the qualitative advances in the scientific-technological practice on which the society's resistance to decadence always depends.

Since the developments typified in the content of the revolutionary work of Vernadsky and Einstein through, approximately, the time of their deaths during, and in the aftermath of several years during and following the 1939-1945 "World War,"[15] we are properly obliged to recognize the subject-matter of "physical universe" as being represented by three distinct, but nonetheless inseparable qualities of phase-spaces: 1.) The "ordinary" abiotic, 2.) The Biosphere, and 3.) The Noösphere. Following the line of work by Academician V.I. Vernadsky, the principled physical distinctions among these phase-spaces are to be located systemically (experimentally) in their common domain, that of the practice of physical chemistry in the footsteps of those such as Louis Pasteur, D.I. Mendeleyev, William Draper Harkins, and Vernadsky.[16] However, the three identified phase-spaces are also interacting, and evolving *dynamically* as a set: the one shaping the conditions which shape the evolving existence of the other.

The method by which these phase-spaces are to be distinguished, is, essentially, that method of modern European science which is subsumed by the legacies of Nicholas of Cusa and Johannes Kepler. In this method, the notion of the existence of universal physical principles as defined by the common features of the method of Cusa, Johannes Kepler, Fermat, Leibniz, Riemann, et al., is only conditional, but nonetheless crucial. That distinction which I have defined in sundry locations as the principle of the *ontologically infinitesimal* character of the infinitesimal of the Leibniz calculus,[17] provides a model definition of all

15. Vernadsky died in January 1945, Einstein in April 1955.

16. And also, implicitly, in that work of Max Planck which was so viciously attacked by the German and Austrian followers of the radical reductionist Ernst Mach, during the period of the 1914-1917 warfare.

17. In defiance of the common, empiricist Sophistry of de Moivre, D'Alembert, Leonhard Euler, Joseph Lagrange, Laplace, Cauchy, Clausius, Grassmann, et al.

true universal physical principles, principles such as Kepler's uniquely original discovery of universal gravitation, and Albert Einstein's related emphasis on an unbounded, but finite universe of universal physical principles.

All valid universal principles are expressed in detail, as Kepler defined the principle of gravitation, in the form of their characteristic experimental expression as "ontologically infinitesimal."

The appearance of this discovery of what became known later as Leibniz's principle of the "ontologically infinitesimal," by Cusa, also marks the moment of birth of modern science as modern science, including the science which must be employed to define the principles of the subsumed Biosphere and abiotic domains.

That discovery, as presented by Cusa, marks the rebirth of the same principle implicit in the work of the Pythagoreans and Plato. Cusa, recognizing a systemic error in Archimedes' quadrature of the circle and parabola,[18] first presented the principle of the *comma,* from ancient *Sphaerics*, into the practice of modern European civilization. This notion by Cusa was the foundation of competent development of modern science, as from the discovery of the principle of gravitation by Kepler, the notion of a principle of least action associated with a discovery by Fermat, and the first development of a calculus, by Leibniz, based on the notion of the *ontologically infinitesimal* expression of universal physical principles, as those are rightly premised on the previously stated principle of Kepler for this purpose.

Briefly consider the crucial historical implications of the immediately foregoing statements.

For example: the essential experimental basis for Einstein's celebrated insistence that the universe as a whole is *conceptually finite*, has ancient roots traced implicitly to times prior to the practice of *Sphaerics* by the Pythagoreans:

*Sphaerics*, as a legacy of very ancient practice of celestial navigation, as with the maritime cultures existing under the conditions of widespread glaciation, toward which the planet is threatened, again, over the long haul ahead, is obviously the relic of seasonal and otherwise repeated celestial navigation over distances as long as thousands of miles; only under those conditions could mankind have discovered the qualitative changes, as distinct from, and opposed to the conception of apparent simple (cyclical) repetition, a discovery which were necessary for the discovery of a reigning principle of qualitative, progressive change in the composition of the navigator's and calendar-builder's celestial array.[19] Astrophysics was, necessari-

18. I.e., Cusa's exposure of the systemic error in Archimedes' quadrature of the circle.

19. Compare Philo of Alexandria's denunciation of the theology of Aristotle's method, and the echo of Philo's denunciation of Aristotle for astrophysics by Kepler. Note, as most notable, Kepler's exposure of the specifically Aristotelean fraud central to Claudius Ptolemy's fixed system.

## Kepler on Aristotle's Sabotage of Astronomy

*Johannes Kepler (1571-1630) refuted Aristotle's geocentric cosmology, and charged that Aristotle held science back for nearly two millennia, until the advent of Copernicus, by rejecting the Pythagorean idea that the Earth moves in an orbit around the Sun ("the fire"). Kepler's full document was published in 21st Century, Winter 2001-2002, in a translation by George Gregory. These are excerpts.*

*Johannes Kepler, the founder of universal modern physical science.*

[The Pythagoreans] spoke in a veiled way; by fire they understood the Sun, and I agree with them, that the Sun is in the center of the world, and never moves away from this place, and that, on the other hand, the Earth moves once in one year around the Sun, that is, it revolves around the center position of the world, as otherwise also five other wandering stars [that is, the planets]....

[Aristarchus of Samos (310-ca. 230 B.C.) was accused of blasphemy and threatened with death for endorsing a heliocentric system.] On account of this fear, and on account of the reputation of Aristotle, who rejected this teaching (although he did not yet fully understand it), this teaching was suppressed, and particularly because it was difficult to understand, it was nearly forgotten for 1,800 years....

I am as little satisfied with Aristotle, when he thinks it is sufficient to have asked why the Earth remains at the center of the world, and to answer, that nature assigned this position to it. For it is entirely uncertain, and not conceded by me, that the Earth is in the middle of the world; and were it so, it would be so indeed on account of nature, but in the same way that all things are on account of nature. But one is not satisfied to know that things are according to nature, but one asks why they are that way and not some other way, and what means nature used to bring this about....

ly, the beginning of actually scientific knowledge—of the notion of the actually universal, and, thus, of the *Sphaerics* which the Pythagoreans and others adopted from Egypt-Cyrenaica. That typifies the deep roots of humanity's acquisition of *that quality of universal knowledge which is the only practice worthy of the name of science*.

Since the ancient Classical Greeks, as these are typified efficiently by the Pythagoreans and Plato, the modern European standard for the definition of science was set by Nicholas of Cusa, that done in a series of his works typified by his ***De Docta Ignorantia***. A competent form of universal modern science was established by the crucial discoveries of principle developed by Cusa's avowed follower Johannes Kepler. As Einstein emphasized on this same account, modern physical science in its full span, is lodged under the developed form of the work of Bernhard Riemann, but is rooted as a body of physical-scientific practice in the achievements of Kepler. It is with the argument by Einstein, that the concept of physical science was returned, full cycle, to that development of astronomy by ancient celestial navigators, as Bal Gangadhar Tilak emphasized in his review of a relevant selection of combined ancient and modern sources.[20]

The distinction to be made is between the naive view of science as a fallacy of composition in design of merely repeatable experiments, as in the hoax of Clausius, Grassmann, et al., and science as a discovery of patterns of progressive (i.e., *anti-entropic*, rather than merely cyclical) change of the conditions of experiment under the impact of the discovery of relevant, long-ranging, universal physical principles.

The latter view is forced upon competent observers today, by the way in which relative potential population-density of the human species has been shaped, uniquely, for the human species: by the effects of willful progress of human practice to higher states of potential relative population-density, that through discovery and adoption of those higher principles of change which Aeschylus' Olympian Zeus forbade. *As I have already emphasized here, this development within the Noösphere reshapes the physical geometry of that Biosphere in ways which are to be seen as the effects of the changes which are effected in, and radiated from the higher realm of the Noösphere.*[21]

In the span of the known history of the known cultures centered on the Mediterranean, the kind of society which that Olympian Zeus's policy prescribed, is known to scholars as "the oligarchical model," under whose reign most people are reduced to the likeness of cattle by imposition of rules of no-change ("zero growth") which are reflected, typically, in Malthusian fads, and fascist political systems today. This oligarchical model has been the persisting origin of the degenerative crises, such as the present one, which mankind has experienced in known history.

### Riemann & the Principle of Hypothesis

Thus, the implication of the revolutionary advance in physical science introduced by Bernhard Riemann, as first introduced in his 1854 habilitation dissertation, has led to the recognition that we must consider our universe as finite, that in the specific sense of being "finite but unbounded"—"self-bounded." This quality of finiteness, is expressed by mankind's expanding knowledge of sets of discovered universal physical principles, as each such principle is to be defined by the model of Kepler's discovery of gravitation.

A true universal principle is never itself an object of the senses, but is a principle which is shown, experimentally, as Kepler proved the case of gravitation in his ***The New Astronomy*** and the ***Harmonies***, combined, as underlying (i.e., confining) the physical geometry of the relevant universal class of actions.

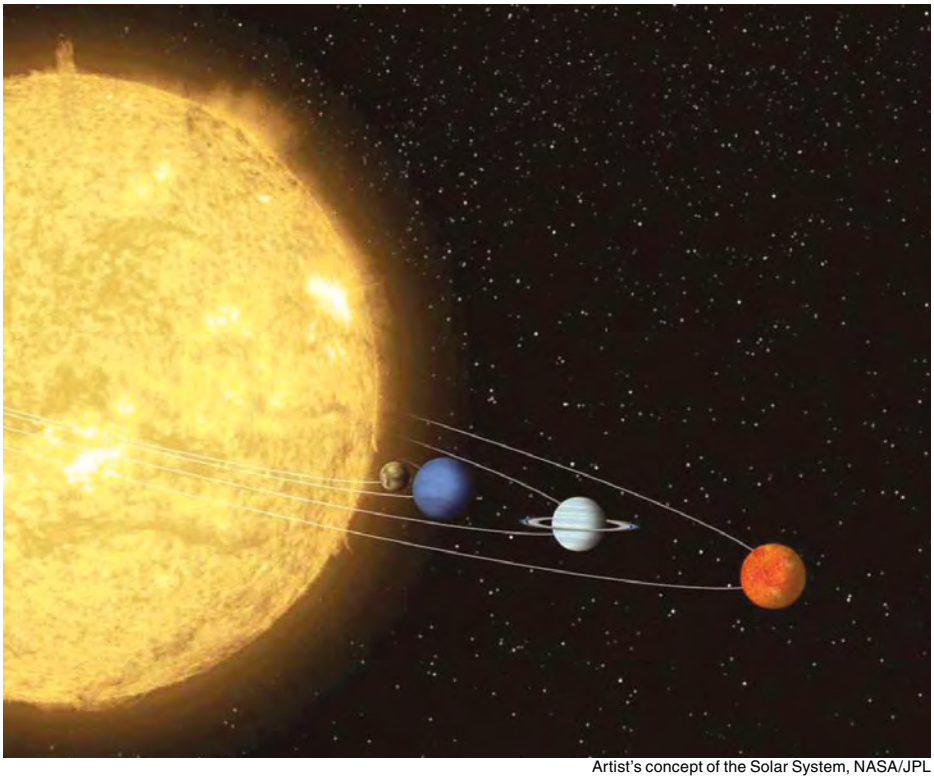
For that reason, the universe is known to be finite in the sense that any such universal physical principle is self-bounded (and therefore not externally bounded) as to relative magnitude "1," and that its local expression, as an efficiently acting universal physical principle, is therefore that of an ontologically infinitesimal quality of that action upon its subjects, as the work of Kepler's ***Harmonies*** shows. Thus, we have, contrary to the empiricists and positivists, Leibniz's derivation of the ontologically infinitesimal calculus from Kepler's discovery of universal gravitation.[22]

Thus, since the time since the immediate post-World War II period, since the deaths of Vernadsky and Albert Einstein, evidence from the domains of physical chemistry has defined three clearly defined domains: First, and lowest, the abiotic domain; second, the Biosphere; and third, the subsuming power of the Noösphere. These domains are familiar to us by comparing the known patterns of growth of the latter two domains, the Biosphere and Noösphere, relative to the portion of the Earth's crust which is apparently not a product of physical-chemical changes done by living processes. Generally, the Biosphere and its residues are growing, in ratio to the mass of the crust, and the mass

20. *I.e., Orion, or Researches into the Antiquity of the Vedas* (1893) and *Arctic Home in the Vedas* (1903).

21. Consider the impact of what are largely "transuranic" istopes of specifically biological significance, a present line of development which echoes Vernadsky's impact on Russian geological science since the visit of Prince and later Czar Peter the Great to the site of the Freiberg academy (near Dresden).

22. As in the authentic discovery of a quantum principle by Max Planck (the adversary of the Machian positivist ideologues) later, Kepler's discovery of the organization of the system of gravitation of the Solar System, depended upon rejecting a purely visual (sense-perceptual) notion of the organization of the Solar System, by making the ontologically paradoxical juxtaposition of the notion of visual and aural sense-perception ("sight" and "sound"). There is no "empty space" in the organization of nature in the very small or very large. The hysteria exhibited, in defense of a childish blind faith in sense-certainty, by what were otherwise leading scientists, on the subject of the indispensable role of harmonics in defining universal gravitation, has continued to be a crucial, leading barrier to the progress in physical science today. The wild attack on Max Planck by the German and Austro-Hungarian dupes of Ernst Mach and Bertrand Russell, during and following World War I, should be compared with the common, and usually wildly lying hysteria against Kepler on the same account of "sense-certainty." In both cases, Kepler and Planck, the crucial issue is ontological: the refusal of the opponents to realize that the human sense-readings are merely the reactions of instruments which present us what are, so to speak, the mere shadows of reality: this to such effect that the paradoxical evidence of sight and sound, rather than the evidence of one alone, must be treated as, for example, Kepler did in defining the harmonics of gravitation itself, and Planck in his great discovery.



Artist's concept of the Solar System, NASA/JPL

*At some point in human history, man discovered astrophysics, and recognized that "the starry skies above did not represent a simple system of repetitive cycles, but expressed the existence of a universe in endless qualitative development, from relatively simpler to more complex, higher order (anti-entropic development of) systems of the universe as a whole."*

of the Noösphere (human activity and its specific products) relative to the Biosphere.

Vernadsky rooted these distinctions in methods of a Riemannian practice of physical chemistry. Those methods, with their suitable enrichment, should be considered the implied authority to which I refer in this report. [23]

The distinctions include the specifications, that: 1.) Without the principle of life, there is no development of the Biosphere within the Earth as a whole; 2.) Without human cognitive activity, there is no further development of the Noösphere within the Biosphere. From the standpoint of physical chemistry, those distinctions signify the notion of man and woman as made in the likeness of the Creator, relative to the Biosphere.

Hence, the "teleological" feature of the universe so defined. Without a universal principle of life, there is no biology; without a universal principle of human creative reason, lacking in all lower forms of life, there is no Noösphere. Thus, the abiotic Solar System (and beyond) is necessary for the expression of life, and living creatures are a necessary precondition for expression of the distinctive quality of human life; but, the principle of the Noösphere subsumes all. We must think of these principles as universal physical principles in the same sense as Kepler's uniquely original discovery of universal gravitation, but as of the quality of a different such universal principle. All three principles, including gravitation, share the character of being immortal *as principles*.

### 'Sense-Uncertainty'

The root of the functional quality of mental disease called reductionism, is the notion of "sense-certainty": that is to say, the notion that we are obliged to accept certain fancifully false notions of space, matter, and time, such as definitions, axioms, and postulates, without further investigation, this on the premise that this represents acceptance, *a priori*, of the stubbornly persisting evidence of our sense-perceptual apparatus as such. This systemic error is met in ancient through modern European traditions as the basis for that variety of Sophist method associated, successively, with the doctrine of Aristotle, as this variety of Sophism is echoed by the followers of Aristotle in the celebrated ***Euclid's Elements***.[24]

We do not know the actual time and place of the crucial breaking-point in mankind's experience, at which actual science displaced the pathetic worship of "sense-certainty." We do yet know that what is to be rightly seen as the history of science today, which can be identified as emerging in the time and place in the history of man's discovery of astrophysics, whatever were exactly that time; it became, thus, apparent to ancient masters of celestial navigation who recognized that the starry skies above did not represent a simple system of repeti-

23. The argument, by Vernadsky, to which I referred in my "Vernadsky & Dirichlet's Principle," *op. cit.*

24. Essentially, the main body of content of the *Elements* is in the form of systemic reification of hypotheses and theorems which had been defined earlier by, notably, the circles of the Pythagoreans and Plato. As the relevant principle was most famously clarified by Archytas' purely constructive demonstration of the duplication of the cube, Classical Greek physical science, as in the Egyptian-Pythagorean *Sphaerics* echoed in the work of Thales and Heracleitus. The characteristic of that Classical physical science of the Pythagoreans and Plato, was the same notion of underlying physical principles as expressed essentially by the experimental methods associated with the concept of the same ontologically infinitesimal represented by Kepler's discovery of the harmonic, rather than naive visual-space-like basis for a measurable value of organization of the Solar System.

Our various specific sensory powers are of the quality of instrumentation of our experience, presenting our minds with what are the shadows which reality prompts as perceived sensations. The contrast of two opposing qualities of perception, such as vision and hearing, was indispensable for Kepler's discovery of the quantifiable principle of gravitation. However, although this principle of anti-Euclidean geometry was already clear to such predecessors of Riemann as the great Eighteenth-Century mathematician Abraham Kästner (and, actually, if secretly, Carl Gauss), it was not until Bernhard Riemann's explicit expulsion of all reductionist method from physical science, that the problem had been placed in clear focus for modern science.

tive cycles, but expressed the existence of a universe in endless qualitative development, from relatively simpler to more complex, higher-order (anti-entropic development of) systems of the universe as a whole. This fact has been made clear to those among us who actually think according to that realization of the implications of Bernhard Riemann's fundamental revolution in physical science, a realization which is best represented today by the fundamentals of the work of Academician V.I. Vernadsky and Albert Einstein. Thus, no longer can science be considered competent, if it proceeds on assumptions based on interpretation of experience of what is esteemed as being contained within the abiotic. Competent science always looks from the top of the evolution of the changes within the universe, to the lower qualities of its organization. Competent science today is premised on Einstein's conception of a Riemannian universe of Kepler and Kepler's precedents, proceeding always from the foundation of science found only in those cognitive powers of the individual human mind whose typical achievements are sampled in the Riemannian universe, as that has been defined in exemplary fashion by Vernadsky and Einstein.

The great curse of prevalent modern science dogma, is that it is essentially empiricist, or, in its far more degenerate expressions as either positivism, or, even worse, existentialism.

Thus, competent science today proceeds from the origin expressed by the specifically creative powers of the human individual mind. Science must define itself as our knowledge of the universe as the progress of man's power to control, and to develop his universe; this shows us what the universe demands of us, and what it will tolerate from us as the practice, expressed through man's power in and over that universe, as that power is increased in such expressed terms as systemic increase of the potential relative population-density of the human species.

## 2. Anti-Entropy: The Principle of Creation

Thus, the secret of our universe is, that only beasts, or bestialized human beings, such as, in the worst cases, Malthusians like former U.S. Vice-President Al Gore, fail to recognize that, among all living species, mankind, and only mankind, is creative by its true, willful nature. For the competent human individual, there is no law of "entropy" in this universe, but only the misleading appearances represented as effects of a cultivated habit of stupidity, or worse, among some unfortunate people, sometimes very many people. For that faulty habit, do not blame humanity indifferently; blame some relevant people, including those wretched Sophists, such as those of the legendary press which were responsible for the policy behind the minting of that ***New York Times*** style book which has ripped the true Pythagorean *comma* of human creativity from its pages.

The crucial theme here can be summed up in a single statement, thus: ***The universe, viewed, properly, top-down, is the habitat of the reign of the Noösphere!***

*Strelka (left) and Belka, Soviet dogs who orbited the Earth in 1960—the first animals to survive orbital flight. LaRouche agrees with Soviet space scientists of that time, that dogs are more intelligent than chimpanzees. But there's something essential here that Al Gore et al. fail to grasp.*

### Dogs, Apes, & Humans

Those who recall the U.S.A. vs. Soviet rivalry in "the space-race" of the 1950s and 1960s, may also recall a debate, whether dogs were more intelligent than chimpanzees (the Soviet policy). Frankly, dogs won that contest. The crucial fact of the matter, is that dogs have a better potential for *relevant* qualities of seemingly *human-like intelligence* than *adult* chimpanzees. (Any dog-lover also familiar with the traits of the adult chimpanzee, can be attracted to this fact.) To settle the issue, it were sufficient to consider a candid debate of this matter, between a trainer responsible for managing adult male chimpanzees, and the proud and insightful human companion of a pet dog.

Let us seem to cheat just a bit, but that only for a pedagogical purpose. Let us compare adult pet male chimpanzees with adult dogs raised as household pets. We really are not cheating in doing this. When we compare the behavior of animal species, we must consider the relevant qualities for humanity of the adult representative of the species, as by comparing adult male chimpanzees who had been pets as "children," with the adult development of the household puppy when it has become an adult.

Actually, contrary to the opinion of some children and adults, a dog does *not* develop actually *human* intelligence; the pet dog acquires what might be described as an "echo" of human intelligence.[25] Here, the dog out-classes the chimpanzee. The pet dog develops what appears to be something resembling a hu-

25. My wife and I have "owned" a number of dogs: several Irish Setters, two Great Pyrenees, and one West Highland White Terrier. There are "breed" characteristics, but there are also developed "personalities," which are manifest as expressed "insight" specific to the dog and to the household into which it is assimilated while a puppy.

man form of personality; that dog tries to simulate ("imitate") the personality of a human being, perhaps regarding its owner as representing, in ethical and family terms, the kind of authority due its mother, father, or human sibling.[26] The relevant distinction was noted by the Cardinal Nicholas of Cusa, who reported this kind of apparent simulation of human intelligence among animals. *Thus, the Noösphere "educates" the Biosphere.*

For purposes of an introductory, exploratory discussion of such matters, we might say that the dog's simulation of what seems to have been the behavior of the higher order of living species, the human individual, is "programmed," although—*God forbid!*—never "digitally" programmed. Cusa compared God to the "soul" of man, as man to the "soul" of the animal, that in appropriate terms of reference.

The content of those preceding paragraphs is to be treated as a necessary, brief, playful, but nonetheless a valid, introductory discussion, that as a matter of providing a background orientation for the discussion of the "hard point" which I am about to introduce thus.

**The Folly of Sense-Certainty**

Among all known species existent within our Solar System, the form of human mental performance which is specific to the conception of the *ontologically infinitesimal* principles of physical science, such as Kepler's discovery of gravitation (and also of the discovery, as by J.S. Bach, of true Classical artistic composition), is unique, among all species, to human individuals. Thus, to the extent that the human brain might be considered, wrongly, by some, as merely a higher order of development of animal brains, that assumption leaves no basis for a truly noëtic intellectual creativity of the quality expressed by the modern cases of Cardinal Nicholas of Cusa, Kepler, Fermat, Leibniz, Riemann, or of J.S. Bach, W.A. Mozart, and Ludwig van Beethoven, creativity which is not so encountered in the biological mental-perceptual apparatus of the brain-function of mammals in general.

The clue which points toward a solution for the relevant mystery, may be found through examining a certain systemic quality of paradox in Kepler's discovery of the harmonic organization of the Solar System. The specific quality of that discovery, by Kepler, which has driven even many serious, if somewhat misguided scientists into a fury, is that Kepler's solution involves the principled, *musically* defined, *Lydian*, *Florentine bel canto* faculty of hearing. Whereas, as a matter of contrast, the scientist who was heavily indoctrinated in the Sophistry of Aristotle-Euclid, will tend, with rare exceptions, to react with his or her own personal performance of some sort of a "freak show," when confronted with the implications of the indispensable function of hearing, as Kepler was confronted: when confronted with the paradox which threatens the peaceful contemplation of any merely visual conception of organization of space-time.

"Tuning" is an extremely useful piece of scientific pedagogy for the purpose of defining the experimental subject, when confronting that acutely paradoxical fact. It is a related fact, that all evidence available indicates, that *there is nothing intrinsic to the apparent physiological organization of the brain-function of the mammals which accounts for the unique role of the individual human mind in reproducing the phenomena of the Noösphere.* There is something, related to the notion of "tuning," as defined by Kepler's discovery, and by J.S. Bach, which accounts for this unique species of experimental fact.

The relatively more obvious point made by that sort of "thought experiment," is that a sane reaction to Kepler's treatment of the paradox of harmonics in defining the measurable effect of the principle of gravitation, compels the seasoned experimentalist to accept the fact that his, or her own sense-perceptual apparatus is an array of instrumentations, to such effect that the sundry "meter readings" from that inborn array of experimental apparatus must be treated as just that. So, what seems almost self-evident, almost Euclidean or Cartesian, if only one of the human senses is being considered, may be transformed into the inducing of a state of stark confusion in the mind of the unwitting, when two, or more, different human senses, such as sight and hearing, are being applied to define a single common image of the common experimental subject.

For example:

In the relatively simpler case, the naive student "believes" it to be more or less self-evident, that astronomical space is defined by discrete objects, such as planets, moons, and sundry forms and sizes of intra-Solar-System particles, each and all appearing to float when such phenomena are assessed as being within a background-medium of what is presumed to be, in its own nature, as Cartesian empty space. Similarly, the Max Planck-hating dupes of Ernst Mach, such as Ludwig Boltzmann, may proffer a childish misreading of what he considers, on principle, as reducible, conceptually to a percussively organized gas system.

In these cases, the experimental validity attributed to the mechanistic representation, is to be recognized as the result of interpreting what may be, within limits, experimental phenomena viewed in terms of a mechanistic fantasy derived from the *a prioristic,* mechanistic methods of Aristotle and Euclid. As long as ideologues continue to interpret the evidence, axiomatically, on reductionist presumptions, they may be self-satisfied with their formulations. This may continue until they are faced with the experiment which presents what they must view as profoundly anomalous results, as Riemann's 1854 habilitation dissertation shows, or as Kurt Gödel, in 1931, demonstrated the fraudulent character of Bertrand Russell's ***Principia Mathematica***.[27]

Such childish Euclidean-Cartesian fantasies as those of the followers of Mach and dupes of Russell, are precisely the source of the confusion of the physicist experiencing a banshee-fit

26. We had a Great Pyrenees, who accepted a West Highland White Terrier as a puppy of the family, but seemed, over years, to grow increasingly troubled by the fact that that puppy never seemed to be growing up.

27. Kurt Gödel, "On Formally Undecidable Propositions of *Principia Mathematica* and Related Systems," (1931), in *Kurt Gödel Collected Works*, Vol. I (New York: Oxford University Press, 1986), pp. 144-195.

when being presented with Kepler's harmonic composition of the gravitational, wrongly presumed "action-at-a-distance" field of the Solar System,[28] or in that domain of Planck's work which the radically reductionist dupes of the positivists (e.g., radical empiricists) such as Mach, or one like Bertrand Russell, misidentified as quantum "mechanics." At that point, a few words from a Kurt Gödel or Albert Einstein are sufficient to send the radically reductionist cult-followers of Mach, Russell, Norbert Wiener, John von Neumann, et al., into howling fits worthy of the dismay which might have been expressed, at the close, among the suffering characters of H.G. Wells' ***The Island of Dr. Moreau***.

The alternative to reductionist fantasies of "sense-certainty," is to consider physical space-time as a true continuum of existence-in-motion. That means that the exclusion of the notion of something existing which must yet be moved, in favor of the accepting the realization of that "motion," motion otherwise recognized as action in the sense of a continuing process of development, must be accepted as the intrinsically ontological quality of existence. This means *dynamic* existence, not in the sense of the reductionist's nonsense word "thermodynamics," but as in the method of the ancient Pythagoreans and Plato, or the modern followers of Cusa, Leonardo da Vinci, Kepler, Fermat, Leibniz, Riemann, et al.

Rejection of sense-certainty does not mean rejecting the role of our senses; rather, we must recognize that the senses are indispensable in the two respects indicated here below. What must be rejected, for the sake of competent science, is the hedonist's blind faith in "sense-certainty."

Firstly, we must appreciate the implications of not only Helen Keller's plight, but her accomplishment in overcoming what might have seemed her hopeless situation. Her achievement does not justify deprecating those senses whose use she lacked; but, rather, appreciating the importance of the new instruments of cognitive method and apparatus which science develops, new instruments which enable mankind to explore such otherwise forbidden realms as the universe and sub-atomic space-time.

Second, although the relatively competent expressions of modern science have demonstrated, afresh, that the picture of the real world given to us by the senses as such is not the real world, but is, at best, only a faithful shadow of reality: nonetheless a shadow on whose assistance we depend for guiding our investigations into the real world of the unseen. The most significant outcome of recognizing this irony, is that we must learn to discard all forms of naive sense-certainty, such as the *a prioristic* Sophistries of Aristotle, Euclid, and Descartes. We then learn to use those senses, both those given to us by birth, or instruments we adopt as supplements to the senses, to discover more and more of the nature of the actual universe which we inhabit, and, in that manner, and in that process, discover the most precious among all of the secrets of science, the true identity of ourselves, and our place in this Riemannian universe at large.

Library of Congress

*Helen Keller's accomplishment in overcoming both deafness and blindness shows that cognition is not based at all upon sense-certainty. Here, Keller is exploring the shape of a statue.*

**Riemann Again**

In treating the mental disorder called "sense-certainty," we must take into account, from the outset, that the problem of sense-certainty as it has confronted us in European culture, persistently, since approximately the death of Plato, is a product of the rise of what is known as the form of European Sophistry attacked by Plato's dialogues. This means attacking, specifically, the form of Sophistry which ancient, medieval, and modern Sophistry have inherited from Aristotle and such among his notable followers as Euclid.

I repeat: there is crucially significant, surviving evidence to the effect, that the great trans-oceanic maritime cultures whose experience is reflected to us from the ancient Egypt known to Solon, the Pythagoreans, and Plato, possessed a scientific method, identified as *Sphaerics*, which was largely free of those falla-

28. The case of the Crab Nebula should, therefore, drive him wild!

cies of sense-certainty which I have ridiculed in the opening pages of this present chapter of the report. Also, we must recognize, that there have been traces of the scientifically healthy, pre-Euclidean scientific world-outlook radiated by Plato, as by currents of Judaism and Christianity typified by Philo and the Apostle Paul, at various times and in various locations, over the course of ancient and medieval European times prior to the great work of Nicholas of Cusa in founding modern science.

In all modern European history, there was a great struggle, from the time of Kepler, Fermat, and Leibniz, until that of Riemann, during which a lunatic, so-called Cartesian and Newtonian view of science, that of the *a-priorism* of Aristotle, Euclid, Galileo, and Descartes, was made prevalent, either through the imperial influence of the Habsburg and other Inquisitions, or by the influence of the Anglo-Dutch Liberal imperium; *until Riemann broke open the doorway to truth with his 1854 habilitation dissertation*.

On this account, it must be recalled, that the echoes of Cusa, Leonardo da Vinci, and Kepler, were expressed in the mid-Seventeenth Century of France, under the leadership of Cardinal Mazarin, Jean-Baptiste Colbert, and Gottfried Leibniz, until this progress was interrupted by the emerging primacy of a modern Liberalism which emerged during the Anglo-Dutch Liberal wars leading into the February 1763 launching of the neo-Venetian form of the world's presently continued, British empire-in-fact. So, despite the later great Eighteenth-Century Renaissance led by Abraham Kästner, Gotthold Lessing, Moses Mendelssohn, Friedrich Schiller, and the Monge-Carnot Ecole Polytechnique, the Jacobin Terror and the reign of the predator Napoleon Bonaparte, crushed, once again, the new, late Eighteenth-Century Classical Renaissance.

That tyranny of the Habsburg Inquisition of Grand Inquisitor Tomás de Torquemada, on the one side, and that of the Anglo-Dutch Liberalism of Paolo Sarpi and his followers, on the other, had already established the massively corrupting influence of Paolo Sarpi's system of Liberalism over science, art, and politics. The British imperial tyranny over the Vienna Congress's Europe, and the British deployment of the early-Nineteenth-Century Spanish monarchy's continuation of British John Locke's earlier promotion of the trans-Atlantic slave-trade, continued to dominate science until the circles of that great organizer Alexander von Humboldt succeeded in unleashing the great revolution in physical science of Wilhelm Weber, Lejeune Dirichlet, and Bernhard Riemann. Once more, that same Liberal sophistry dominates our modern European culture, with its schools, universities, and popular opinion, still today.

It was upon the signal contributions of the later geniuses, such as the great, later achievements of such exceptional geniuses as Vernadsky and Albert Einstein, on which the net progress of science has chiefly depended. During the entire sweep of the 1854-2008 interval to date, the uttering of Riemann's 1854 habilitation dissertation, has become the great long wave of revolution on which the greatest net achievements of science have, subsequently, thus far depended.

Thus, as great as was the revolution which Bernhard Riemann launched in his 1854 habilitation dissertation, there was nothing essentially new to European civilization's science in the great principle through which Riemann shattered the darkness of Euclidean superstition. Once the 1854 habilitation dissertation is understood, its origins, its outgrowths, and its implications for now, were, already, essentially grounded in fact.

Since Riemann's habilitation dissertation, the principal source of moral rot in modern physical science, has been that great hoax, called "thermodynamics," as crafted by the scientifically and morally decadent circles of Clausius, Grassmann, and Kelvin. This corruption is typified, to the present date, by what has become that implicitly mass-murderous, Machian hoax and fraud of modern mechanics, the hoax named "The Second Law of Thermodynamics."

That much said this far, the considerations which I have outlined up to this point in the report, have taken us, repeatedly, during the preceding pages, up to the verge of the great conclusion standing before us: the notion of *the ontological infinitesimal*.

### The Noösphere as Such

The development of the concept of the Noösphere has depended essentially on the insight into that evidence from that approach to physical chemistry by Mendeleyev and Harkins, which Academician Vernadsky summarized in the middle of the 1930s. Although there is often a temptation by some reporters to locate the discovery of a principle of life by Pasteur, rather than crucially significant phenomena expressed by living processes, Pasteur himself rejected a precocious conclusion in the matter; he did so correctly, on the premises of his knowledge of what a proper scientific method must require as adequate proof.[29] We, still today, must show similar caution in stating claims pertaining to the Noösphere; however, as much of what we know to have been proven respecting the implications of the proven existence of the Noösphere must be accepted, despite deeper issues yet to be defined.

Today, as I have emphasized the implications of the questions implicitly posed by the referenced work of Woese et al., we must be concerned with a higher order of challenge, the Noösphere, as Vernadsky clarified the questions respecting the Biosphere. Living processes express a different physical chemistry than non-living processes, thus defining a specific phase-space known as the Biosphere. Then, how shall we approach the higher order of subject, the Noösphere?

We know that the Noösphere has been discovered by (actually) Academician V.I. Vernadsky. We also know from crucial experimental evidence, that the Biosphere is dominated functionally by the Noösphere: that to such effect that the Noösphere contains the Biosphere functionally, such that no generalizations respecting the Biosphere can exclude the superior role of the Noösphere.

We must recall, that the proof of the discovery of the hypoth-

29. LaRouche, "Vernadsky & Dirichlet's Principle," *op. cit.*

R. Gehrz/NASA-JPL-Caltech

*The Crab Nebula presents an array of paradoxes to the scientist. It is rapidly changing, even pulsating; yet it is presumed to be immensely large. The changes that occur in its structure take place synchronously throughout it, seemingly like waves propagating at a velocity faster than the speed of light! Such anomalies drive the reductionists crazy.*

esis by Vernadsky was supplied by the evidence of the growth of the accumulated mass generated by the Biosphere's phase-space as products specific to the effects and residues of the masses of living processes. The growth of the Biosphere, so defined, relative to the phase-space generated as supplied by non-living processes, supplied the proof needed, even though we have yet to receive a competent experimental definition of "historical" origins of life as such.

The same standard required to define the Biosphere is to be applied to the case of the Noösphere, with one very distinct qualification. Crucial is the evidence on which any competent science of physical economy depends: that the percentile of the mass of our planet representing products of human cognitive activity not otherwise produced by the processes of the Noösphere itself, has been increased through, chiefly, the effects of scientific and related advances in the goals and technologies of human societies.

The crucial fact thus emphasized, is that this increase of the relative mass of the Noösphere, is, uniquely, the now well-defined product of what is termed *noësis*. This pertains to activities, which are expressed uniquely by their ontologically infinitesimal expression (as I have already emphasized at earlier points of this report), as those processes of discovery of true universal physical principles which have no place in the reductionist methods of ancient Sophists such as Aristotle and Euclid, or in modern empiricist and related practice.

*This distinction of the Noösphere confronts us, at least typically so, with its evidence of the paradoxical type of case, an anti-entropic case, in which the future determines the present.*[30]

For example: in the case of the Biosphere, we have had the relative advantage of being able to define the Biosphere by reference to the higher state of organization in the universe which contains the definition of the Biosphere, the Noösphere. We can not approach the subject of the Noösphere with such an available kind of advantage. The paradoxical effect is more or less limited to the fact that it is the discovery of a principle which often serves as the cause of a qualitative change in the quality of effect of human action (for example) on the universe. This, in turn, confronts us with the factual existence of the discovery of a necessary truth of practice (i.e., Classical Platonic hypothesis), this even before the relevant, new experimental principle of action was *discovered negatively*.

To illustrate the existence of such points: such an anomaly is suggested, although not otherwise known to have been proven, yet, by the evidence of the ostensibly anomalous ordering of certain kinds of changes which occur in the Crab Nebula.

Take, for example, the related fact that it was Fermat's remarkable, unique discovery of the principle of least action, which prompted Leibniz to overthrow the authority of Huyghens' cycloid, and to base a universal physical principle of least action on the analog functions which led to this revolution in defining the notion of actual physical principles.

These and related considerations lead us toward three great paradoxes.

First, that the greatest moments of scientific discovery are those in which a revolutionary change *in the future change of the ordering in our universe of practice* appears to some human

30. This has been the "secret" of my unique, current success as the most successful long-range forecaster in economics.

mind as an inevitable consequence of evidence, a universal principle, yet to be employed in practice. How has this been possible?

Second, what is the mysterious, yet undeniable power of the individual human mind's design which permits an individual human being, but no animal, to make such a type of valid discovery of the necessary change in principled modes for shaping of the future?

Third, how does the individual human mind manifest such a unique power, with no precursor for this in the Biosphere as such?

Is it some principle of "tuning?" Has the development of the human mental-biological apparatus taken the human species to a point at which it is "tuned into" a higher power in the universe, a higher power which is not only expressed as truly anti-entropy, as defined by the great Eighteenth Century mathematician Abraham Kästner, but a supreme universal physical principle of anti-entropy? So, Philo of Alexandria condemned the Aristotlean's theological insistence on the self-inflicted, permanent impotence of the Creator, and did so on the basis of the strongest quality of argument in evidence against such an absurd theology, and, implicitly, against an absurd, Aristotelean, Claudius Ptolemy-like misconception of science.


NASA

*Mankind's effect on the universe is anti-entropic! Here, NASA scientists and engineers in the Mission Operations Control Room celebrating after Apollo 11 made man's historic first landing on the Moon, July 24, 1969. Inset: a close-up view of an astronaut's footprint in the lunar soil during the Apollo 11 mission.*

There are two cases of such crucially significant behavior. In one case, there is the universe in the large, as governed by an anti-entropic principle driving the universe into successively higher qualitative states of organization as a universe. In the other case, as posed in ***Genesis*** 1, mankind acts upon its place in the universe to similarly anti-entropic effect. In the other aspect of the matter, we have the evidence that the human mind has a potential quality which, by sheer weight of definition, is not a product of its biology as we define biology today, but the "tuning" of the human form of thinking to agreement with cognitive powers which have never been shown to exist in lower forms of life. Yet, as is shown by the growth of the Noösphere, relative to the Biosphere, this power of the human mind is fully efficient within our universe.

As Nicholas of Cusa presented the case, as our Creator of the universe is to man, so man mimics that Creator in man's spiritual power over, and obligation to caring for dogs.

The more modest point to be proffered in this context, is the evidence that the universe is intrinsically anti-entropic, and that the obligation which mankind must meet if mankind is to survive, is to act in the way the Creator of our universe has governed. We are properly "tuned" to be creatures devoted to the service of anti-entropy, such that those who express a contrary view, such as the Malthusians and former U.S. Vice-President Al Gore today, are therefore evil in what they do in service of entropy.

With respect to the great question which has been the subject of my report here, we are in a predicament with practical implications like those confronted by Louis Pasteur on the matter of life. We do not have the true solution; but, we must not avoid the implications for the present practice of science, of the unanswered, stubbornly persisting question which it would be incompetence to avoid. In science, until we pose the question, as I have proposed we do here, we will never begin to discover the answer.

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*Lyndon LaRouche, a statesman and economist, is on the Scientific Advisory Board of* 21st Century. *A version of this article appeared in* EIR *magazine, April 11, 2008.*

THE ISOTOPE ECONOMY

# Producing More and Better Food

Lothar Wedekind/IAEA

# Using Nuclear and Stable Isotopes

*by Marjorie Mazel Hecht*

*Isotope technologies to increase food production and preserve crops are ready to be mobilized now to help feed the world!*

*Above: New varieties of rice and other crops have been developed at the Agricultural Genetics Institute in Hanoi, using radioisotope technologies, in collaboration with the IAEA. Here, a test plot at the Institute in 2004.*

In the early days of the U.S. Atoms for Peace program, scientists realized that the nuclear fission process could be used for more than just producing electricity and heat. They planned to harness radiation for all sorts of beneficial applications: desalinating water; sterilizing medical supplies and equipment; cancer diagnosis and treatment; space travel; industrial radiography (as diagnostic tracers or for detecting flaws in welds, for example); breeding stronger, more versatile seeds and plants; monitoring agriculture and livestock; controlling insect pests by sterilizing male insects; and disinfesting food crops and extending their shelf life.

For the Atoms for Peace visionaries, the benefits of radiation had no limits! For this reason, the Malthusian oligarchic forces intervened to squelch this optimism, institutionalize scientific pessimism, and to make radiation into a

scary word.[1] What the Malthusians feared was that full use of the benefits of radiation would make it possible for all nations to ensure a decent standard of living for their *growing* populations, and that the citizens of nuclear economies would become smart enough to continue to develop technological innovations to support a growing world.

Today, there is no way that our world's 6.7 billion people can survive and thrive, unless we go nuclear, as those pioneers of the 1950s and 1960s intended. This means building 6,000 nuclear plants by the year 2050, simply to keep up with the expected demand for electricity.[2] It means reindustrializing the post-industrial economies by mobilizing around vast infrastructure projects, like the Eurasian Land-Bridge, using the methods that succeeded in the Roosevelt-era Tennessee Valley Authority (TVA). It also means a vast expansion of the known and well-tested nuclear technologies for increasing the food supply—insect control, plant and animal breeding, and food irradiation.

### Proliferating Technological Benefits

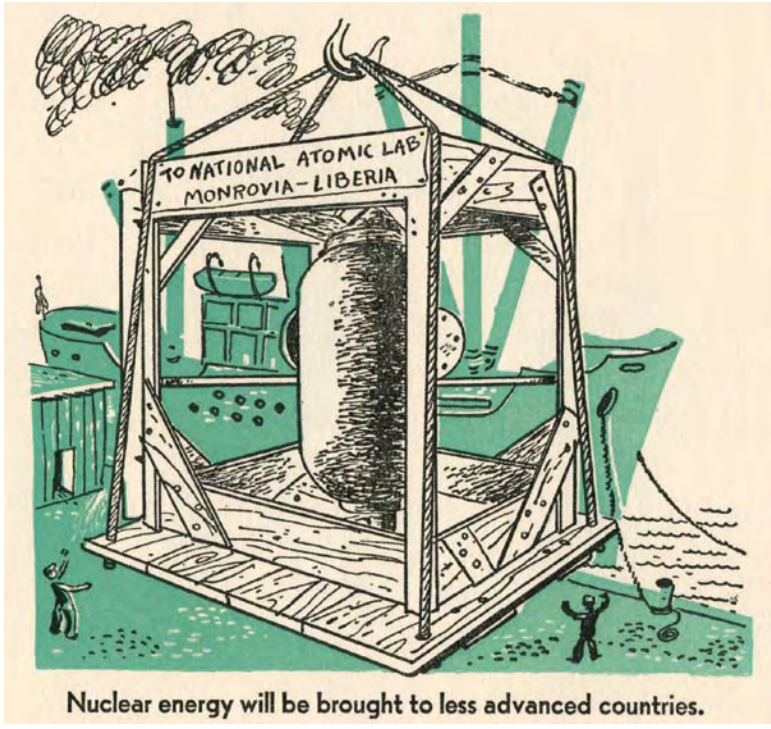
The main international agency that has sponsored nuclear technologies in the developing sector is the International Atomic Energy Agency (IAEA), which turned 50 in 2007. The IAEA's Technical Cooperation Program, with a budget of $76.8 million, placed about 4,400 trainees in 2006 throughout the world, working in nuclear-related areas. When you consider that we need to double world food production to eliminate hunger, this level of funding and staff is but a drop in the bucket. Imagine what could be done in Africa, for instance, if the projects briefly outlined here were multiplied to exist in every country on the continent.

**Plant breeding** is one of the IAEA's major Technical Cooperation projects, using controlled mutation induction. This technology, based on the natural mutation of plants, uses radiation techniques to induce genetic changes, from which the favorable characteristics are selected and used to breed new plants. In this way, plants can be made saline resistant, drought resistant, sturdier, or higher yielding.

At a mid-August International Symposium on Induced Mutations in Plants at the IAEA, the head of the agency's Department of Nuclear Sciences and Applications, Werner Burkart, told the 600 plant scientist attendees in his opening address: "Since mutation induction in plants began over 80 years ago, nearly 3,000 varieties from more than 170 different plant species have been introduced, resulting in higher nutritional content, more successful agricultural output, and positive economic impact. Among the many successes of induced mutation is production of wheat in drought-prone parts of Africa, growing of barley in the high Andes mountains of Peru, and boosting of rice production in Vietnam."

Kenya's research program, in cooperation with the IAEA, is one of the success stories in plant breeding. The Kenya Agricultural Research Institute (KARI) has developed a high-yield, drought-resistant wheat seed, using radiation-breeding techniques. The new wheat seed, Njoro-BW1, was developed over the past decade with mutation plant breeding, under the direction of Prof. Miriam Kinyua, former chief plant breeder and director of KARI. Njoro-BW1 was bred to use limited rainfall efficiently, and it also has only a moderate susceptibility to wheat rust, high yields, and good quality grains for bread baking. With this new seed, farmers have greened the hot and barren dry lands of Kenya, making use of land that was formerly considered unfit for crops.

Wheat is the second most important cereal crop in Kenya, after maize, but the country currently imports two-thirds of its wheat, at skyrocketting prices. Thus the new wheat is vital for




*This illustration by George Wilde from the 1955 children's book,* All About the Atom*, by Ira M. Freeman (Random House), captures the Atoms for Peace spirit of that time. As the text states about the less advanced countries: "The main reason for the slow development of many of these lands is the shortage of power." Nuclear energy could make "the neglected parts of the world flourish. In just a few years, they could make more progress than in many centuries before."*

1. See Marsha Freeman, "Who Killed U.S. Nuclear Power," *21st Century Science & Technology,* Spring 2001 www.21stcenturysciencetech.com/articles/spring01/nuclear_power.html; and Marjorie Mazel Hecht, "The Neo-cons Not Carter Killed Nuclear Energy," *21st Century,* Spring-Summer 2006.

2. James Muckerheide, "How to Build 6,000 Nuclear Plants," *21st Century Science & Technology,* Summer 2005, www.21stcenturysciencetech.com/Articles% 202005/Nuclear2050.pdf

H. Agbogbe/IAEA

*Prof. Miriam Kinyua (left), former chief plant breeder and director of KARI, led the drive to produce new varieties of crops in Kenya, including Njoro-BW1 wheat. Here she is walking with farmers and KARI staff in fields seeded with the new drought-resistant wheat.*

Kenya's food security. A second wheat variety, DH4, is expected to be released soon. This shares the qualities of Njoro-BW1, and is also hard and red, with high protein and good bread-baking qualities.

In the past five years, in Africa alone, six new varieties of crops using radiation breeding have been released, including sesame in Egypt, cassava in Ghana, wheat in Kenya, banana in Sudan, and finger millet and cotton in Zambia. Such techniques have also been used to develop crops that can tolerate saline soil.

A joint IAEA/UN Food and Agriculture Organization program, which maintains a plant breeding laboratory in Seibersdorf, Austria, has established a network of promising genotypes of selected crops, providing them to farmers. This included in 2006: soybean (in India, Indonesia, and Thailand), peanut (in Bangladesh), mung bean (in China and Pakistan), and sesame (in the Republic of Korea).

Another success story is in Morocco, where saline tolerant plants are beginning to green the otherwise barren saltlands, where the soil has one-third as much salt in it as the ocean. The IAEA estimates that there are more than 80 million hectares of saline soil worldwide that could be greened, in what are called biosaline nurseries. Egypt, Jordan, Syria, Pakistan, Iran, Tunisia, and the United Arab Emirates are now involved in this project.

Stable isotopes are used in the saline project not just for breeding, but also for screening plants to determine their salt tolerance. This involves finding out the relationship between salt tolerance and the ratios of two isotopes of carbon in plants—carbon-12 and carbon-13. Pakistan, which has 6 million hectares of saltlands, is working with Morocco on this project.

**Insect sterilization.** The Sterile Insect Technique is the only example I know of a good population control program! Male insects are laboratory reared and then sterilized with gamma irradiation. When released into the field, their mating with female insects will produce no offspring. The technique has been used for 50 years as a means of controlling insect populations, usually in conjunction with other methods, such as chemical pesticides. (This is because the insects still bite.)

Insect sterilization has been successfully used on six continents for several different pests: the fruit fly; Mediterranean fruit fly (medfly) in Chile, Mexico, California, and Southwest Asia;


Lothar Wedekind/IAEA

*Village leaders and farmers in the village of Thanh Gia in North Vietnam, checking a crop of DT-36 rice in 2004. This hardy variety was developed using radiation technology at the country's Institute of Agricultural Genetics in Hanoi, with IAEA support.*

varieties of moth; the melon fly in Japan; and the screwworm in the United States, Central America, and Libya. These pests have caused billions of dollars of damage to food crops and livestock. There are now 10 insectaries—sterile fly breeding factories—the two largest being in Guatemala and Mexico.

The most dramatic success story is the eradication of the tsetse fly from Zanzibar. Tsetse flies attack both humans and livestock, transmitting the sleeping sickness disease (Trypanosomosis), which kills off herds of cattle and debilitates or kills its human victims. In sub-Saharan Africa, there are 22 species of tsetse fly endemic, over 10 million square kilometers (3.86 million square miles). Widespread pesticide-spraying programs in Zanzibar had failed to eradicate the tsetse.

IAEA

*Breeding better plants: IAEA researcher Rome Montepeque working with plant mutations in the IAEA's Agricultural Section.*

The model program in Zanzibar began in 1994, releasing 72,000 sterile male flies per week by airplane (in biodegradable containers). The flies were mass-bred in insectaries in Tanzania. The sterile flies were marked with a fluorescent dye, so that the ratio of sterile to non-sterile flies could be monitored in traps set across the island to catch the flies.

The last wild fly was captured at the beginning of September 1996. (It was entombed in a Lucite cube and sent to the then head of the IAEA, Hans Blix!)

Another success story is in Southwest Asia, where farmers from Israel, Jordan, and the Palestinian Authority are collaborating to let loose millions of sterile male medflies in the Arava Valley, where this destructive pest turns citrus and other fruit to mush. The flies are released between the Red Sea and the Dead Sea in a two-hour flight.

**Livestock breeding.** The gains in livestock productivity come from the use of isotopes in monitoring animal nutrition. Radioactive trace elements track digestive processes to help scientists evaluate changes in the animal feed, and design feed that enables the animals to produce better quality milk and meat. The IAEA/FAO program developed an easily digested urea-molasses additive (known as UMB) to animal fodder, for example, that fosters growth, milk production, and reproduction. The UMB is locally produced, and has increased milk production by 10 to 25 percent.

Radioimunoassay techniques, using radioactive iodine to label and track a hormone, have also advanced animal breeding in developing countries, upping milk production and improving reproduction capabilities.

**Agricultural efficiency.** Both radioactive and stable isotopes are used to track nutrients in soil and provide information for more efficient use of mineral fertilizers. Better soil and crop management as a result of this information has allowed farmers in Africa and Asia to increase yields, under the IAEA/FAO technical cooperation programs.

The same is true for the efficiency of water use. Neutron moisture gauges, for example, can accurately measure the moisture in soil. When used with new irrigation methods—mini-sprayers and drippers—the technology has allowed farmers to increase yields with less water, applied in specific stages.

### The TVA Method

All of the isotope-based technologies have the potential to increase the quality and quantity of the food supply, as they have already demonstrated for years. But the results are still small-scale compared to the need. The IAEA/FAO program described here was funded at about $76 million a year in 2006. Most of the projects are aimed at improving the lot of the small farmers who make up the majority of the developing sector's agriculture. Imagine the results of gearing up the program in every nation, on the scale of the TVA.[3]

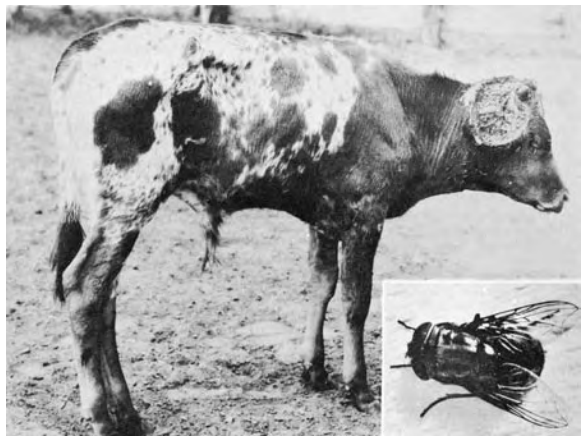
In the 1930s, the Tennessee Valley Authority catapulted a vast area of the U.S. Southeast into the 20th Century, from poverty

3. See the 1945 TVA film, "Valley of the Tennessee," at www.larouchepac.com/news/2008/07/15/ full-versions-documentary-footage-used-film.html

Petr Pavlicek/IAEA

*Defeating sleeping sickness: Laboratory technicians in Ethiopia's fly-breeding center separating larvae before they hatch. Inset: Sterile male flies will produce no offspring when they mate.*

Harald Baumgartner/IAEA (for flies)



Lloyd E. Brownell, *Radiation Uses in Industry and Science* (Washington, D.C.: U.S. Atomic Energy Commission, 1961), p. 342.

*The screwworm is the larva of the fly shown in the inset, which is about three times the size of a common housefly. Screwworms can kill a steer in 10 days if untreated. The female lays eggs—about 200 at a time—in any cut or wound in cattle. The eggs hatch to maggots (screwworms), which then destroy healthy tissue, producing oozing wounds that attract more flies. Irradiating male flies to make them sterile has eradicated screwworms, including in the United States in 1960.*

and backwardness. The Federal TVA project, initiated by FDR, planned a large-scale operation to dam the Tennessee River and its tributaries at 49 points, so that rural communities would no longer be at the mercy of nature's whims—floods and droughts.

The building of the dams was essential, but so was the transformation of the people in the area. The TVA recruited farmers into using new methods—contour farming, fertilizers, and new machinery such as tractors. Thirty-thousand farmers were recruited, and their farms served as teaching projects for their neighbors, bringing up the level of farming in the area.

Schools, hospitals, and roads were built. Children could see a future for themselves, a way out of the traditional Appalachian poverty. The TVA brought hope to a forgotten region of the country in a time of Depression. Today we need similar methods to save the lives of millions who are without adequate food to sustain them and to build the infrastructure necessary to eliminate poverty and hunger.

This infrastructure development is crucial in order to make full use of another important tool in increasing the food supply: food irradiation. This technology was envisioned at the dawn of the nuclear age as a lifesaver. Its research was pursued with passion by pioneers, who saw it as a way to provide combat troops with good nutrition, to provide safe food for those who were immune-compromised, and to ensure the safety of the food supply by killing microorganisms. Yet, more than other food-related nuclear technology, its development has been suppressed, or used merely for the specific benefit of the food cartels.

This non-development of food irradiation is a real crime, at a time when 25 to 50 percent (and often more!) of the food produced in the developing sector is lost to rot or insect and rodent contamination.

### The Promise of Food Irradiation

The use of nuclear isotopes from cobalt-60 or cesium, or radiation produced by electron beams, to preserve and disinfest foodstuffs has been researched since World War II. It is safe, relatively cheap, and extremely effective in disinfesting fruits and vegetables; preventing sprouting in onions and potatoes; preserving grains and other stored crops intact for human use, without loss to insects, rodents, and other pests; and eliminating food-borne disease. The taste, texture, and nutrition of the food

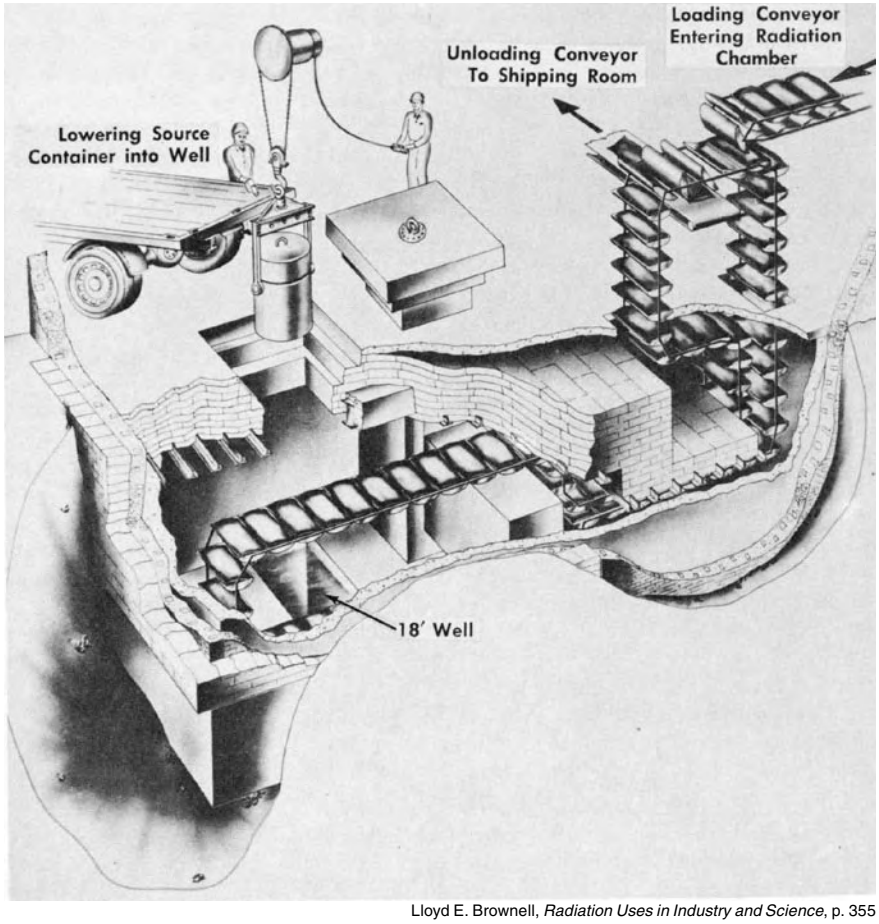
are preserved.

The radiation process exposes food to low levels of ionizing energy, which can come from three sources: gamma rays (using cobalt-60 or cesium), machine-generated electrons, or X-rays.

The very-short-wavelength radiation penetrates solid particles and kills microorganisms by breaking down the cell walls or destroying metabolic pathways, so that the cell dies. The ionizing energy passes through the food (and its packaging) and kills microbes, bacteria, insects, insect eggs or larvae, parasites, and molds.

Higher-level irradiation can be used to sterilize food, so that no refrigeration is needed. Astronauts, for example, have eaten irradiation-sterilized meals, to prevent foodborne illnesses in space. Cancer patients and others with compromised immune systems also benefit from radiation-sterilized food.

As U.S. public health expert Dr. Michael Osterholm has stressed, there are three pillars of public health that have made the increase of lifespan possible over the last century: pasteurization, immunization, and chlorination. The fourth pillar, he insists, is food irradiation, about which he comments, "I can find very, very few issues in the area of medicine and public health that have unanimous agreement and support of every major public health, medical, and scientific organization in the world."




Lloyd E. Brownell, *Radiation Uses in Industry and Science*, p. 355

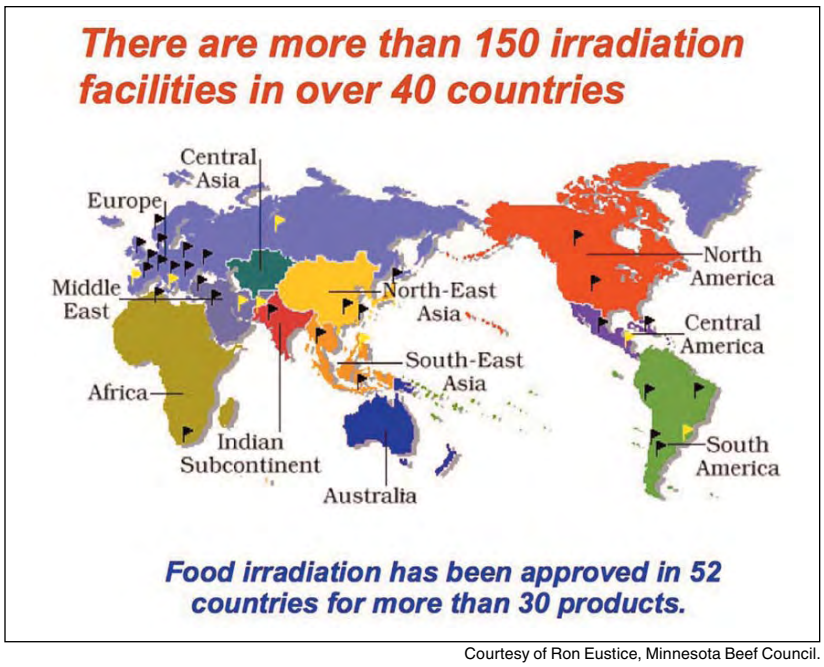
*Schematic of a flour irradiation facility, designed to treat 100-pound bags of grain, flour, or meal to control insect infestation. At the time, 1960, the estimated cost for a commercial facility like this was $38,320.*

Food irradiation has recently been in the news, because on Aug. 22, the U.S. Food and Drug Administration gave the approval for low-level irradiation of iceberg lettuce and spinach to kill the *E. coli* bacteria responsible for widespread illnesses and several deaths. Many products are approved for irradiation in the United States, including spices, grains, fruits and vegetables, poultry, chopped meat, eggs, animal feed and pet treats, and shellfish. Probably most readers have had the benefit of irradiated spices—free from critters and microorganisms—even without knowing it. An estimated 175,000,000 pounds of spices were irradiated in the United States in 2005. In the same year, 18 million pounds of meat and 2 million pounds of fruits and vegetables were irradiated. Other products are available for consumers on a limited basis.

The recent U.S. press coverage has brought out the familiar chorus of fearful naysayers, who have been raising the same, often ignorant or lying objections to irradiation for the last 30 years. From my experience, the purveyors of such irrational or ideological objections have no intention of correcting their misinformation. For more on this topic, readers are referred to other available sources.[4] Instead, the focus here will be on food irradiation in the developing sector.

Food irradiation has been approved in 52 countries for more than 40 products; and there were 150 irradiation facilities in 40 countries, and as of 2005, 20 more irradiators were in construction. From the early days of Atoms for Peace, the IAEA has been concerned with bringing the benefits of irradiation to the places that need it most in the developing sector. The IAEA has researched irradiation technology since the 1950s, testing to find the optimal irradiation conditions for various products. What is the lowest radiation dose, for instance, that will delay sprouting in onions and potatoes, thus making these staples available for consumption for longer periods? All of the IAEA results were made available for use by developing countries,

4. For more information on food irradiation, see www.21stcenturysciencetech.com/steele.html and www.21stcenturysciencetech.com/hecht_irra.html. The Food Irradiation Processing Alliance also has a useful compendium of frequently asked questions on its website, www.FIPA.US, with links to reports on food irradiation by the American Council on Science & Health and the Institute of Food Technologists.




Courtesy of Ron Eustice, Minnesota Beef Council.

*One billion pounds of food are now irradiated per year for preservation and disinfestation—a tiny amount compared with the percentage of post-harvest food lost to spoilage in areas where people are going hungry.*

through its Food Preservation Section.

The IAEA teamed up with the FAO to offer assistance to governments for specialist training for food irradiation, feasibility studies, and economic development. In the early 1990s, four countries were selected for economic feasibility studies for large-scale commercial irradiators—Chile, China, Mexico, and Morocco.

Some nations began their irradiation program decades ago. Thailand, for example, began irradiated onions (to delay sprouting) in 1971. This was followed by the irradiation of fermented pork sausage, nham, a popular Thai food, which has high consumer ratings. Now, Thailand irradiates many foods, including wheat and wheat products, spices, shrimp, strawberries, and rice. Also in 1971, South Africa began irradiating potatoes, onion, fruits, spices, meat, fish, and chicken. Japan began marketing irradiated potatoes in 1974. Israel approved the irradiation of animal feed in 1973. Russia began irradiation of fruits, vegetables, spices, cereals, meats and poultry starting in 1959; Ukraine began irradiating bulbs, roots, and tubers, as well as poultry and meat in the early 1960s.

China began irradiating spices, vegetable seasonings, sausage, and garlic in Chengdu in 1978. A larger facility in Shanghai began in 1986 to irradiate apples, potatoes, onions, garlic, and dehydrated vegetables. The Shanghai facility aimed at processing about 45 percent of the city's annual supply of vegetables.

Consumer acceptance in China was high: A marketing test in 1985 of 25 tons of apples labeled "irradiated" sold out in less than two days, which surprised the project leadership, because the apples were treated to hold for months in storage. Another survey showed that 10-20 percent of vegetables spoiled every year, at an estimated cost of tens of millions of yuan (minimally $3 million), while fruit loss was estimated at 28,000 tons, valued at 12 million yuan.

Based on the IAEA feasibility study, the Chinese government allocated about $1.1 million to design and construct a commercial irradiator in Beijing to process rice, garlic, and other items for the domestic market. China planned a system of commercial plants, building them near major transportation centers or important agricultural areas.[5]

**Commercialization and Globalization**

Despite all this activity, commercial food irradiation did not scale up to meet its promise in the 1980s, and certainly not in those countries most in need. The interest was widespread in the developing sector, but development was suppressed largely because of the technology suppression in the United States. Although the U.S. Army and many other laboratories had researched every aspect of irradiation and the specifications for each type of product (and although astronauts were routinely fed irradiated meals to make sure that they did not get food-borne illnesses in space), the commercial powers in the poultry, meat, fish, and produce industries were not interested in the technology. A crushing deterrent was the paradigm-shift to a post-industrial, anti-science culture, with its well-funded Malthusian green groups who opposed any technology that would allow population growth.

This situation changed in the "globalization" and cartelization era of the 1990s, for two reasons.

First, as Europe and the United States outsourced more of their food supplies, imported fruits and vegetables had to be disinfested before importation. Tropical fruits like mangos and papayas, and citrus fruits, for example, could harbor fruit flies that if imported would devastate domestic crops. A frequent disinfestation method (after traditional pesticides were banned) is to pick the fruit green and submerge it in a hot water bath. (This accounts for the tasteless, wooden quality of many long-distance-shipped fruits.) Irradiation provides a solution: Fruit can be picked fully ripe, then irradiated and exported, arriving in a much tastier state at its destination.

When the United States approved irradiation for disinfestation of mangos and papayas, India, which is famous for its mangos, and is the world's largest mango producer, geared up its food irradiation program for the export market. Although India had approved radiation for food preservation in 1955, and

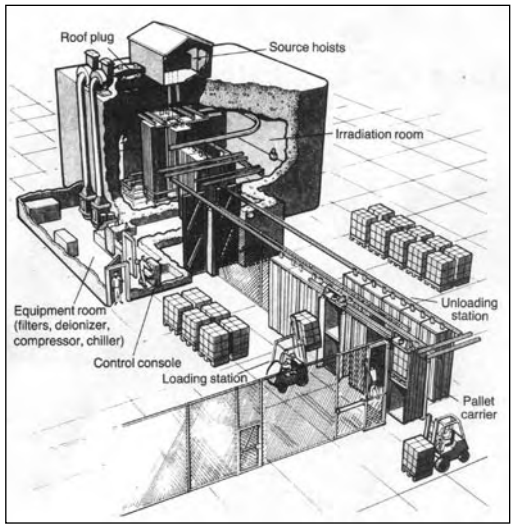
5. Lothar H. Wedekind, "China's Move to Food Irradiation," *Fusion* magazine, November-December 1986.

# How Food Irradiation Works

Food irradiation uses the ionizing radiation (or ionizing energy) from a decaying radioactive isotope like cobalt-60 as its radiation source. Electron beams and X-rays can also be used as a source. Gamma rays are able to penetrate more than 24 inches of product, while electron beams can penetrate only about 3.5 inches (in both cases, irradiating both sides of the food product).

The very short wavelength radiation penetrates inside solid particles and kills microorganisms by breaking down their cell walls or destroying the metabolic pathways of the organism so that the cell dies. At higher doses, all microorganisms are killed, sterilizing the processed food.

There is no radioactivity induced in the processed food. The chemical reactions caused by the ionizing radiation do not involve the atomic nuclei of the food, and therefore the atomic structures in the molecules are not changed. Of course, some natural radiation, called background radiation, is present in all foods, but irradiation processing does not add to this.




*A Canadian design for a standard pallet irradiator with a cobalt-60 source. The boxed product remains on the same pallet from the completion of packaging, irradiation, and delivery to the customer. For a virtual tour of a similar plant, see www.isomedix.com/JS10000_Tour/Index.html*

One of the bugaboos of food irradiation has been the claim that ionizing radiation would change the chemical structure of the food, producing unique radiolytic products (chemicals) that might prove harmful. All the years of testing, however, have determined that of the radiolytic products produced, 90 percent are the same as those in nonirradiated food. The remaining 10 percent are chemically similar to natural food components and constitute only 3 parts per million of the processed food.

The Food and Drug Administration which is responsible for assessing the safety of food irradiation, concluded that the difference between irradiated and nonirradiated foods is so small as to make the foods indistinguishable in respect to safety.

Food irradiation is a "cold" process; that is, it produces no significant temperature increase in the food. This makes it particularly useful for fumigating spices because it does not drive off the volatile substances that give spices their characteristic flavor and aroma. Irradiation also does not damage the nutritional quality of the food.

Decades of research have determined the optimal conditions, packaging, and dose levels for irradiating different types of food products—from grains and vegetables, to shellfish, to cuts of meat and chopped meat. Very low levels of irradiation are required for sprout inhibition (.05 kilogray), slightly more for disinfestation (0.15 kilogray), and greater levels for sterilization (44 kilogray.

Gray*Star, Inc.

*This cobalt-60 irradiator, Gray*Star's Genesis, for food processing, is below ground in a shielded pool. The product is lowered in water-tight containers, called bells, to move past the radiation source in the pool, which is contained in a dry plenum filled with inert helium. This innovative design is less expensive than other irradiators and takes up less space, allowing it to be installed in existing food processing plants.*

*The photo at right, taken through 14 feet of water, shows one of the two product bells next to the source plenum.*


IAEA

*Mangos treated with irradiation can be picked ripe and keep their wholesomeness and flavor longer. High-value mango export has spurred irradiation in India and other countries, but crops for domestic consumption could have a greater impact on the food supply.*

moved ahead with products for domestic use, the mango export market spurred major development in pursuit of this high-cash market. An agreement was signed with the U.S. Department of Agriculture in 2006 for India to export irradiated mangos on a commercial scale, under U.S. supervision. As of June 2007, according to Ron Eustice, executive director of the Minnesota Beef Council, and an expert on food irradiation, 75,000 boxes of mangos had arrived in the United States—about 225-250 tons.

Thailand is also approved for the export of mangos and other tropical fruit to the United States. Peru is considering irradiation for asparagus, of which it is the world's largest producer and exporter. The traditional pesticide for asparagus disinfestions, methyl bromide, is being phased out because of the ozone hoax and its Montreal Protocol.

And so, as hundreds of thousands of people face hunger and starvation, one of the tools for producing and preserving more food in the developing sector has been diverted into globalization's high-cash crops. When I asked one food irradiation expert about this, he commented that it was true, but that the revenue generated in those exporting countries would help their domestic situations. This is the typical "free-trade" argument that the Anglo-Dutch empire has been pushing for centuries—as the poor in their former colonies continue to get poorer.

The second reason for the food irradiation gear-up has to do with the highly publicized U.S. outbreaks of food-borne illness—*E. coli* in chopped meat, spinach, and other vegetables—leading to severe illnesses and several deaths. For many large food producers and cartels, now food irradiation is seen as a profitable and necessary business measure.

**The Isotope Economy**

How do we get from the present situation—the food crisis, the vast underdevelopment of our world, and the imminent global financial collapse that threatens to obliterate civilization as we know it—to the isotope economy, where we will make full use of the known beneficial technologies of the nuclear isotopes and research those not yet known? To do this, we need to revive the spirit of Atoms for Peace today, and institute a crash program to build food irradiation plants and the infrastructure necessary—for harvesting, transportation, and packaging—to the countries that need it most. There are companies that can build a facility to irradiate 50 million pounds of food per year, for $1.6 million, delivered in six months, according to one U.S. expert. With mass production of facilities, the cost and delivery time could be accelerated.

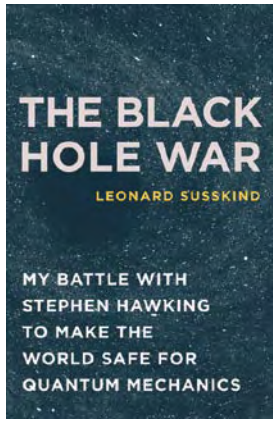
In the Atoms for Peace days in the 1950s and 1960s, food irradiation was seen as so promising that the U.S. Atomic Energy Commission shipped irradiation units to Ghana and Nigeria, for example, for research in this then-nascent technology. There were even plans for small mobile irradiators that could be trucked or taken by rail to harvest sites. What's required now is the political will.

Food irradiation and the other nuclear technologies briefly described here (as well as non-nuclear biotechnologies) are not a "magic bullet" to solve the ongoing food crisis. But they are essential "weapons" in the battle against hunger and disease that are now vastly underused. Any serious campaign to feed the world must expand these technologies—and fully fund the scientific research to discover new beneficial uses of nuclear isotopes. It's time to bring the 21st Century world into "the isotope economy"!

*An earlier version of this article appeared in the* Executive Intelligence Review, *Sept. 12, 2008.*

# I Never Saw a Black Hole, (And Never Hope to See One)

*by Hilton Ratcliffe*




**The Black Hole War: My Battle with Stephen Hawking to Make the World Safe for Quantum Mechanics**
by Leonard Susskind
New York: Little, Brown, 2008
Hardcover, 480 pp., $27.99

Perhaps I'm not the best person to review Prof. Susskind's book. I'm far too inclined, prior to reading it, to sing its praises, for this style of writing—science lite, with soul—is right up my street. It is a tale of human conflict, told from the inside out, and promises to be compelling drama.

As I looked at the cover of *The Black Hole War,* I recalled the tense human interactions of *Interstellar Matters,* Gerrit Verschuur's magnificent revelation of the discovery by pioneer astro-photographer E.E. Barnard of substantial contents in the so-called dark voids in the Milky Way. Dark voids, Black Holes, what's the difference? Immense! And Prof. Susskind should be just the right person to answer my question. The subtitle, "My battle with Stephen Hawking to make the world safer for Quantum Mechanics," was already enough to get my slavering attention. Someone publicly admits to battling with Stephen Hawking, icon of theoretical physics elite? Tell me more!

Susskind and his co-conspirators met at the lavish soirées of Werner Erhard in San Francisco in the 1970s, and it was there that Hawking dropped his bombshell: Information falling into a Black Hole would be irretrievably lost. Not only that, but emerging trickle-radiation, with simultaneous fluctuation of countless mini Black Holes saturating the cosmos, would generate rampant entropy, and along with it, unbridled heat.

Space would in seconds become a trillion-degree cauldron of chaos.

It takes a certain type of scientist to get excited by such a claim. No doubt Professor Hawking was excited, Gerard t'Hooft was excited, and, of course, Leonard Susskind was so excited that he felt compelled to write a book about it. Let me be frank: Even if I had been privy to that meeting of minds, I doubt I would have been excited. Talk of the behavior of Black Holes has always bored me to tears, and whether or not they regurgitate their breakfast is of no concern to me at all. It is all just imagined in brilliant minds, and is obviously not happening in reality. Who cares?

### A Compelling Tale

Nevertheless, Susskind's tale is compelling, for it takes us into that esoteric, ethereal world of quantum theory and mathematical conjecture, where insulated minds are somehow convinced that their predictions have been seen and measured, and we are able to glimpse the stupefying intellectual altitude of Hawking, t'Hooft, Gell-Mann, Finklestein, and Feynman. We get to know the human foibles of a cloistered clique, and it is fascinating!

Susskind calls Hawking the Evel Knievel of physics, and we learn, to our horror, that the tragically afflicted mathematician once emulated Steve McQueen's crazy dash down San Francisco's roller-coaster hillside—in his electric wheelchair! It is these sporadic emotive threads that let the book live and breathe for me, while I am left feeling thoroughly disappointed by the science.

I read on with bated breath, anxious to discover just where Susskind stood on the whole matter of Black Holes in physical reality. When it came, I felt deflated. "But whether Einstein liked them or not, black holes are real," Susskind tells us, "Astronomers routinely study them, not only in the form of single collapsed stars, but also in the centers of galaxies."

Really? I've been an astronomer for over 30 years, have stared intently at many collapsed stars and galaxy nuclei through the eyes of our greatest observatories, and truly, I have never once seen a Black Hole or anything remotely like it. Nor have my colleagues, numbering hundreds, perhaps thousands, worldwide.

When I saw the cover blurb about the author's battle with Stephen Hawking, I warmed in anticipation of a take-no-prisoners debate between intellectual giants, our heroes, which might just lead to a conclusion about the reality of Black Holes. Instead, we have the analogue of a head-to-head conflict on flying saucers that turns out to be a petty argument about whether they are better painted pink or purple.

I really don't care to contest the Black Hole hypothesis, and once I stopped trying, I honestly enjoyed this book. One thing is clear: Leonard Susskind, on the strength of the present work, is a very good teacher. As a Relativity 101 course, *The Black Hole War* is one of the best I've read, better even than Einstein's own introductory texts. For the layman wanting to get into relativistic physics and quantum science from the ground up, this is the book to get.

If, however, like me (and Susskind, apparently), you are not a fan of Minkowski-Lorentz-Poincaré-Einstein relativity, and dislike irrational science (unlike Susskind, a quantum mechanician), then it will be

less useful. You pays your money and you takes your choice.

**Faith-based Beliefs**

So, read this book on the clear understanding that in *The Black Hole War*, the subject is an axiom in the theoretical assumptions of the author. If you have a problem with that, as I do, you will continuously hear discords in Susskind's symphony, false notes in the harmony of spheres. Despite that, I read the book with relish, finishing it in a couple of days, and I ended up enriched by the experience.

I don't have to agree to respect a viewpoint. My point is, when you make a foundational assumption (in this case, that Black Holes do exist, in the form suggested), don't forget that whatever you derive from that downstream, it is all based upon a prior choice between options. It seems we are attributing far too much scientific truth to our faith-based beliefs. No matter; *The Black Hole War* is a good popular-science read, and I recommend it.

*Astronomer Hilton Ratcliffe, of the Climate and Solar Science Institute, South Africa, is the author of* The Virtue of Heresy: Confessions of a Dissident Astronomer *(reviewed in* 21st Century, *Fall 2007).*

# Peering at the Edges of a Unified Concept of the Earth

*by Ryan Milton*

**Earth: The Biography**
Washington, D.C.: National Geographic Society, 2008DVD of 5-episode miniseries, 230 min., $29.95 (Available at http://shopngvideos.com/products/earth_ the_ biography_2)

It is in human nature to want to know why we are on Earth and what processes led to our being here. This internal drive also implies that human beings choose to progress beyond our current existence. That is the nature of discovery. When I was in high school, National Geographic was where research often began for preparing "authoritative science projects," and therefore I was eager to again be enlightened with National Geographic's new miniseries, *Earth: The Biography*. But upon reviewing this series, it became clear that the producers did not want their viewers to develop a better scientific understanding; instead, they wanted to create an emotional, unscientific, antihuman ideology.

This miniseries covers five areas of nature: the atmosphere, the oceans, ice, volcanoes, and something they call "the rare Earth." Over millennia, these natural forces shape and mold the surface of the Earth, "drive the climate," distribute and create all the greenhouse gases, and are intertwined as natural forces to protect life and regulate the environment on a local as well as a global scale. For as long as the geological history can show, massive changes have occurred, frequently in the form of natural disasters: a great meteor that killed all the dinosaurs, or huge volcanic eruptions that burned up Earth's forests, or oceans that dried up and wiped out the animal life. Nonetheless, as shown, the vibrant Earth has been able to recreate all the ecosystems and even new species of complex life.

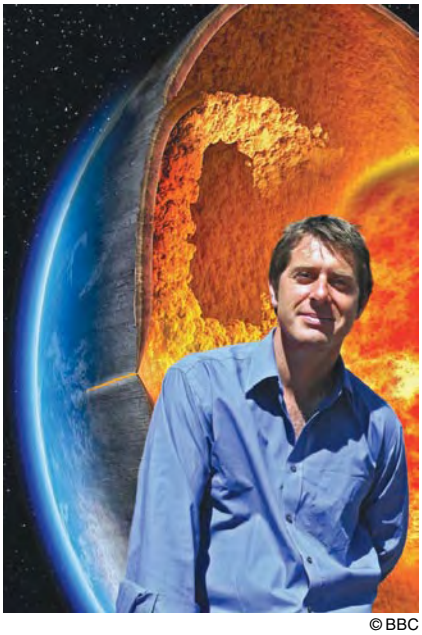
Many questions remain to this day about the beginning of the Earth and the development of life. This series presents a weak version of Johannes Kepler's harmonic orientation of the Solar System, where the relationship of each planet to the Sun and to each of the other planets defines the basis for our unique Earth. Unfortunately, National Geographic's scientists produced no unifying idea of planetary beginning and the unfolding of the three phase spaces of life, the abiotic, the biotic, and the noetic, as Russian biogeophysicist Vladimir Vernadsky showed as one elegant gestalt.

**Fascinating Examples**

Although lacking that higher scientific idea, *Earth: The Biography* does peer at

© Xan Rice/BBC

*Fissures in the ground through a port hole in the Afar region of Ethiopia.*



© BBC

*Dr. Iain Stewart, host of* Earth: The Biography*, in front of computer-generated imagery depicting the perpetual convection of hot plumes of rock from the Earth's core to its crust.*

the edges of such a unified concept. Much basis for the composition of land, air, and water are shown in the films to be the results of both the hot, violent creation of Earth through the initial, "chance" collision of two planets, and then the ice age from roughly 700 million years ago. The combination of these Earth-changing processes is depicted through some fascinating examples, both real (spectacular) photos and animations.

• The massive hot lava lake in the crater of the active volcano Erta Ale in Ethiopia, gives the viewer an excellent look at the creation and destruction of the Earth's surface in a "fast-forward" representation of the flowing, cooler crust, floating and then sinking under, as new Earth is created.

• National Geographic animates the terrific effect on the Earth of the ice age of 700 million years ago, when massive glaciers covered huge portions of the Northern Hemisphere of the globe, below present-day Ohio. The viewer is shown the skyline of New York City from a distance, in order to see the dip in the Midtown area. That dip is the soft sediment that replaced the bedrock moved by the flow of the massive ice-age glaciers.

• We are shown volcano-heated springs of highly toxic water that sustain "worlds within worlds" of microbial life at 75° C, which may have been the basis for the first life on Earth.

• The first life to photosynthesize light into energy and oxygen were the strombolites, bacteria which form hard, rounded mounds from the slime they secrete, and which began as far back as 4 billion years ago.

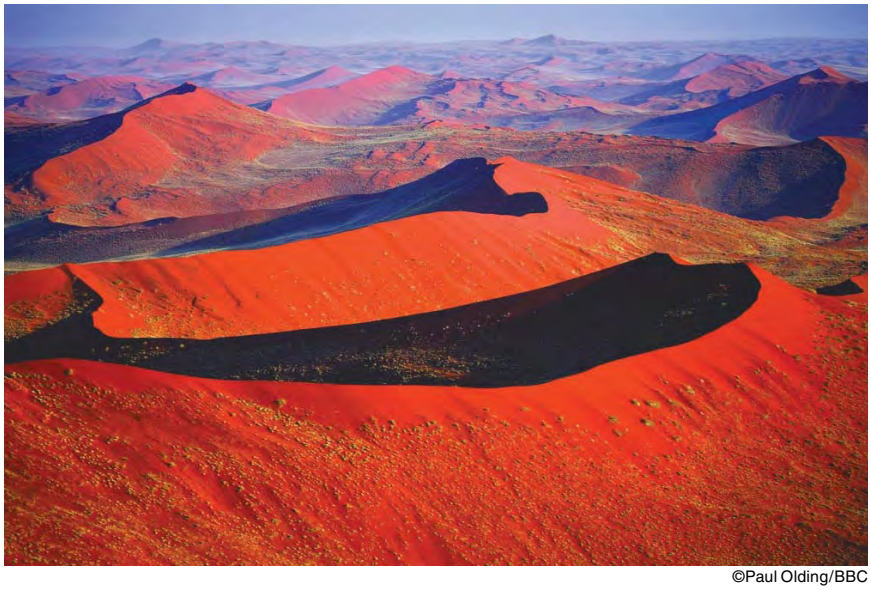
• Phytoplankton are another key species that greatly affects life on the planet. These single-celled creatures are the first to be eaten in the food chain, yet they have a mass effect, in vast "blooms" that can be seen from space through photosynthesis. Phytoplankton create roughly 50 percent of all planetary oxygen—more than all the jungles and forests combined!

Embedded in the "Earth Science 101" storyline is another subtle theme regarding Nature's other inhabitant: humankind. The viewer is uncomfortably informed that human growth may be the one thing violating the pristine equilibrium. How could this occur? You guessed it: global warming.

Narrator Iain Stewart comments that although great glaciers can level mountains, or that the warm Gulf Steam may have caused the last great ice age that ravaged the Earth, these forces are no match for human beings' ability to change the planet—presumably for the worse, because no other view is given. In passing, however, Stewart does admit that conditions *have barely* changed on the Earth since humans first walked the planet.

The thoughtful viewer will find it inconsistent to represent mankind's relatively short existence on Earth as a force greater than planetary interactions and lengthy geologic processes, and thus as automatically destructive. The viewer will also find that he is required to be too dependent on assertions and beliefs, rather than demonstrated principles.

One such example is in the film called "Rare Earth." In order to present the global warming argument, the narrator develops the relationship of the Earth's core to the atmosphere and shows how that affects carbon dioxide. The Earth's atmosphere is regulated by the magnetic field generated by the Earth's iron core. Over time, molten magma rises from the Earth's core and moves the Earth's plates, narrator Stewart says: "Where the plates collide, volcanic eruptions are caused that release carbon dioxide into the atmosphere. Today we think of carbon dioxide as a dangerous greenhouse gas that leads to global warming," Stewart says, "but throughout Earth's long history, carbon dioxide has played a vital role in keeping the Earth at the right temperature for com-



©Paul Olding/BBC

*Dune Sea in the Namib Desert, Namibia.*

©Ben Wilson/BBC

*Banks of coral off the coast of Oahu, Hawaii.*

plex life to survive." The film then continues to note that the world's jungles and forests absorb 25 percent of all the carbon dioxide that is produced and the more carbon dioxide there is, the faster the trees absorb it and grow!

Finally, after continuing to note this kind of happy relationship, the film concludes with the claim that humankind is "pumping" greenhouse gases into the atmosphere at a destructive rate, and endangering this rather hardy planet, and that this is a far more powerful effect than the fantastic process Stewart just described! Nothing is presented regarding human intervention that shows that a primitive existence is far worse than a modern existence, such as the obvious difference between burning jungle biomass for subsistence farming or drug crop cultivation, versus the potential for nuclear power or water management for advanced agricultural cultivation.

To be fair, the flow of the theory is not as compact as I represent here, but National Geographic finally brings it home, stating that scientists agree that human influence is so great that there is now a new geologic age, the Anthropocene Era—or, in other words, the "not-so-great," human era. This is far from the tone of the great Russian scientist Vernadsky and his idea of the Noösphere, where human ingenuity will expand and develop the Biosphere to a higher level of existence and fruitfulness, as man's natural mission.

Instead of asserting that there are new directions in which human creativity can direct the Solar System's development, the film leaves the viewer with the harrowing thought that human beings will destroy themselves by "pumping greenhouse gases" into the atmosphere, but that in a short million years, Mother Nature will recreate herself, albeit, without us.

**A Negative Cycle**

Although much of National Geographic's science about the atmosphere, the oceans, and the climate is certainly true and revealing, I could not help but feel as if I were being led into a cycle of fear, then relief and rage, about many of the potential catastrophes facing the planet because of mankind's existence. All of the fancy animations just keep you watching, so that you get that "Old Time religion," that it were better if there were really not so many people to mess with Nature's own harsh cycles.

What is ironic about this negative view of mankind, is that the film's scientists cannot see in their own examples that it is the living process that creates the most significant effects—mostly for the better—on Earth. Water, and even the air we breathe, are fossils of life, as Lyndon LaRouche has shown [for example, see "Project Genesis," this issue, p. 21—ed.]. Abiotic and biotic life can be continuously developed by increasing the noetic effect through human development and intervention.

## Global Warming Update

*Continued from page 9*

thermostat this winter to keep warm.

## Arctic Ice 2008: Doomsayers Wrong Again

CNN, the *New York Times,* and the British press, among others, all published stories this Summer saying that there was a 50/50 chance that the Arctic would be ice free this year. But it seems that the Arctic was not consulted on this matter.

According to the latest data from the National Snow and Ice Data Center, NSIDC (http://nsidc.org/arcticseaicenews/), this year's melt is some 700,000 square kilometers less than last year's ice melt. To get an idea of size: This 700,000-square-kilometer increase of sea ice is an area about double the size of Germany. The first week in September marks the end of the season's ice melt.

William Chapman, a researcher with the Arctic Climate Research Center at the University of Illinois, told the online *DailyTech* Sept. 3 that this year the Arctic was definitely colder than 2007 (www.dailytech.com/Arctic+Sees+ Massive+Gain+in+Ice+Coverage/article12851.htm). Chapman also says part of the reason for the large ice loss in 2007 was strong winds from Siberia, which affect both ice formation and drift, forcing ice into warmer waters, where it melts.

### Wrong Assumptions

Earlier predictions were also wrong, Chapman says, because researchers thought thinner ice would melt faster in subsequent years. Instead, according to the NSIDC, the new ice had less snow coverage to insulate it from the bitterly cold air, resulting in a faster rate of ice growth.

With the Arctic sea ice refreezing season beginning, will the agencies that track the Arctic have the intellectual courage to issue press releases on the possibility of a new record refreeze this year, or will they keep promoting the global warming alarmism of Al Gore?

## Climate 'Alarmism' Has Become 'Enviro Terrorism'

William Alexander, Professor Emeritus of the University of Pretoria in South Africa and a former member of the United Nations Scientific and Technical Committee on Natural Disasters, accused climate alarmists of turning to terrorism to advance their cause. Writing in the online "$CO_2$ Sceptics" (http://co2sceptics.com / news.php?id=1724), he says, "While the globe was still warming and environmentalist claims were modest, the IPCCs case was impregnable. In these modern times, the environmentalists fed the media with scare stories in order to advance their cause. The media in turn had little interest in repeating the same warnings month after month. So, climate alarmists were forced to increase the level of alarmism. Environmental terrorism is the result."

"These alarmist predictions have backfired," Alexander wrote. "Environmental extremism, and now plain terrorism, is causing tremendous damage to the image of science. It is exacerbated by the failure of conscientious scientists to raise the alarm."

"The IPCC warnings of climate dangers are based on computer models," Alexander said, "that can only generate answers based on the inputed assumptions." Of the models' credibility, he wrote: "I have no more faith in global climate model (GCM) predictions than I have in all those emails from Nigeria advising me that I have won the Lotto, or those proposals from rich widows in Dubai who have just lost their husbands, or from the less frequent emails from my bank asking for details of my banking account. These GCMs are mathematical dinosaurs."

### New Focus: Adaptation

Dr. Alexander also said that if there were a failure to come to an agreement at the Accra Climate Conference in August, that would spell doom for the IPCC, and the global warmers would have to switch to adaptation as the solution. This last point is very interesting because that Accra Conference reached no agreements on anything, and the Sept. 6 issue of the British Royal Society's journal, *Philosophical Transactions of the British Royal Society A,* is dedicated to the idea of adaptation—geoengineering. The lead article of the journal, in fact, is written by global warming maniac Stephen Schneider, "Geoengineering: could we or should we make it work?"

So is "adaptation" the new warming hobby horse, since the planet is failing to warm as their computer models say, and as they are failing to get agreements to cut emissions for the developing world?