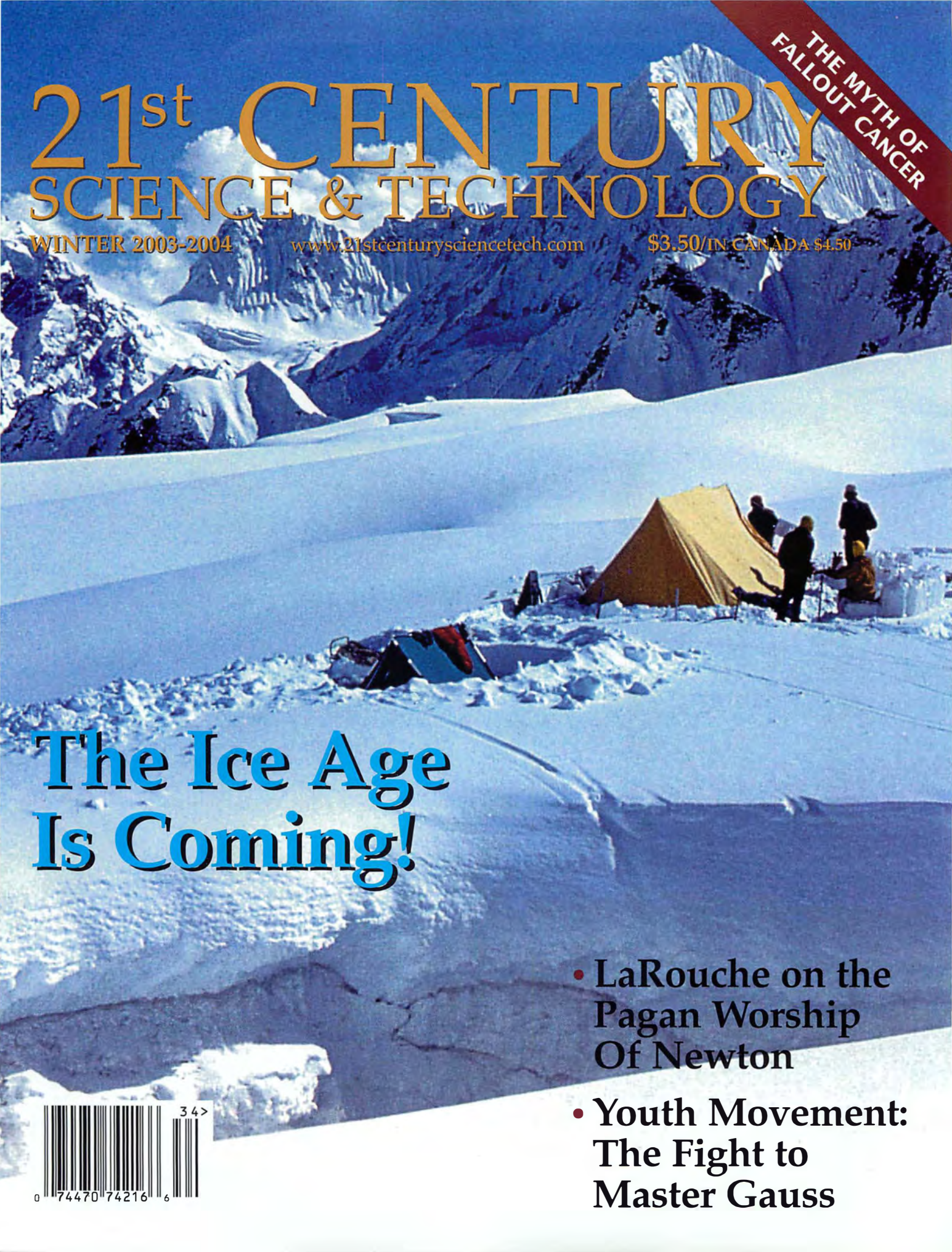
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Base camp of an ice collecting expedition to the Kahiltna Glacier, Alaska. In the background is the ice cliff, with the shaft for collecting samples. Photograph courtesy of Zbigniew Jaworowski.

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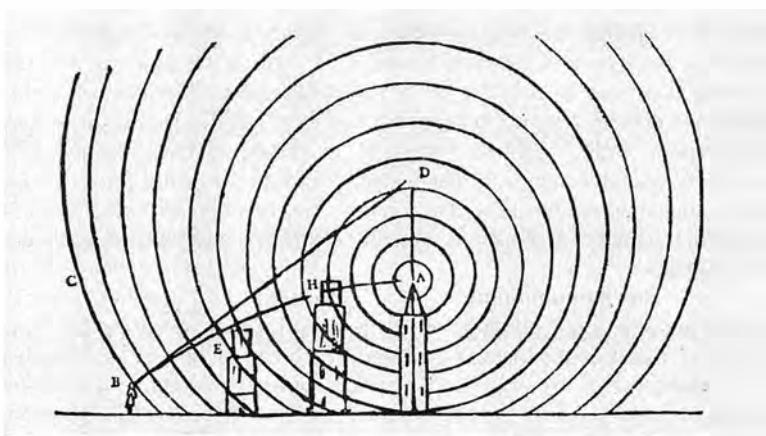
Vol. 16, No. 4 Winter 2003-2004

Science and the Youth Movement

Features



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It was Huygens's Treatise on Light, *not Newton's much-advertised "brand X"* Opticks, *that lit the way to understanding the phenomenon of light. Here, Huygens's drawing of refraction and the spherical propagation of light.*

News

Departments

On the Cover: The campsite of an expedition to excavate ice samples, near the giant Langtang Glacier north of Katmandu, Nepal. The yellow tent is the field laboratory; the small tents, just dug out from a three-day snowfall, are for sleeping. Photo courtesy of Zbigniew Jaworowski. Cover design by Alan Yue.

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Atoms for Peace . . . Or World War

To derail the onrushing descent into the hell of perpetual war, we need a renewal of President Eisenhower's Atoms for Peace program. Those who think otherwise, who have bought the propaganda pitch that we should fear the spread of industry, science, and prosperity throughout the non-West, will soon reap the consequences of their anti-human beliefs, as the world plunges into a New Dark Age.

Yet, anyone willing to stick his neck outside of the straitjacket of accepted "public opinions" can find out that Eisenhower's original proposals in 1953 worked, and will work again.

Atoms for peace! What better remedy for today's fast-sinking American economy, and morality, than a return to a culture based on scientific and industrial progress, not environmental hoaxes and the fear bred of ignorance? Let us again make America's mission the export of the materials, technologies, and skilled workers to build the nuclear plants, agro-industrial nuplexes, and general infrastructure required to bring the advantages of modern life to the rest of humanity.

This nation has past experience with great infrastructure projects (the TVA, for example, or the Manhattan Project), which trained a workforce of skilled laborers, technicians, engineers, teachers, and scientists—people who were able to see in their own lifetime the transformation of America into a prosperous world leader.

What happened to stop this successful American policy? Why do today's "opinion shapers," including the leading scientific press, accept as axiomatic that nuclear technology must not be allowed to spread beyond the small club of nations presently in possession?

The 'Radium Bomb'

The answer is not difficult, once the essential history of the matter is grasped. To understand it, we must look back about a century. Focus on two figures, the philosopher activist Bertrand Russell, and writer H.G. Wells. The two were among the most prominent members of a circle in turn-of-the-century British Empire, who recognized that the survival of their values required the containment of what was then still known as the American System. In the course of a long life, Russell, the grandson of Lincoln's enemy Lord John Russell, successfully managed what the British Empire had been trying to do to its North American colony since the time of the American Revolution: subvert the republican ideas inherent in the American System, and cripple the United States as a force for bringing the benefits of modernization and industry to the rest of the world.

The Russell-Wells idea was to use the fear of war, and the destructive capability of nuclear weapons, to force nation-states to abandon sovereignty for a one-world government that would control all advanced weapons—and all technology. The sick mind of Wells had already envisioned the possibility of "radium bombs" capable of wiping out the population of whole cities, in his 1913 novel *The World Set Free*. Here also, he put forth the concept of a world government, as the only alternative to annihilation. Of course, unstated, was the fact that on top of this one-world government would sit Russell and Wells's beloved British Empire!

This is the origin of the current policy of "non-proliferation of nuclear technology," and its frequently whispered twin, "pre-emptive nuclear attack." They were brought into the present administration by members of Vice President Cheney's shadow government, such as as Defense Policy Board member Richard Perle, the disciple of Russellite Albert Wohlstetter, and other disciples of University of Chicago's Leo Strauss, such as Deputy Defense Secretary Paul Wolfowitz.

The Russell-Wells program was not secret. Wells called it "The Open Conspiracy," the title of a widely read

book that he published in 1928, which aimed to re-order the world—*Blue Prints for a World Revolution* was its subtitle. Both men used their political connections and publicity outlets to saturate the public with their concept of man as a beast, who must be controlled, be fed ideas and religious beliefs, and when necessary for those in leadership, be culled. Population control was a pre-eminent goal for both Russell and Wells.

Those who still think of Russell as a peace activist, would shudder to read his writings on how disease, poverty, and war are necessary and desirable for getting rid of the surplus population, particularly those of color. To take only one of many examples from his books, Russell wrote in *Icarus or the Future of Science,* published in 1924: "For since medicine and sanitation have diminished the infant death-rate, the only checks to over-population that remain (apart from birth-control) are war and famine. . . . Before long, birth control may become nearly universal among the white races; it will then not deteriorate their quality, but only diminish their numbers, at a time when uncivilized races are still prolific and are preserved from a high death-rate by white science . . . ." Russell goes on to promote the use of eugenics by a world government, in order to remedy this situation.

Russell's Wrecking Philosophy

When Eisenhower made his historic Atoms for Peace speech to the United Nations General Assembly, 50 years ago, he called for making "the fear of the atom begin to disappear from the minds of people," and he pledged the United States to share peaceful nuclear technology with the nations of the world (see box, p.4).

Russell's mission was to do the opposite—make "the fear of the atom" predominate—leading with his capture of the scientific community.

In the pages of *The Bulletin of the Atomic Scientists,* in 1946, Russell advocated *pre-emptive nuclear war* as a way of threatening nations, in particular the Soviet Union, not to develop atomic weapons. Russell publicly denied, and then publicly reaffirmed his threat over the years (the pursuit and practice of truth was not in Russell's nature). But it is on the record that Russell advocated, in many speeches and articles, dropping

Mad bomber, Bertrand Russell.

the bomb on the Soviet Union, to make sure that it would not develop the bomb and scientific capabilities.[1] He had no concern for the death and destruction this would cause. His aim was to establish world government, for the Anglo-American Empire.

In November 1952, the United States tested the world's first hydrogen bomb, many times more powerful than the bombs dropped on Hiroshima and Nagasaki. Several months later, the Soviet Union, tested its first hydrogen bomb, in August 1953, an event that startled the West. It was the Soviet H-bomb that set pre-emptive warrior Russell onto his "peacenik" career. When threats would now not work to cow the Communists into submission, it would be best to join them—"better Red than dead," so to speak. Russell launched his disarmament campaign, accelerating his anti-nuclear activities after Eisenhower's "Atoms for Peace" speech.

Russell began organizing in scientific circles around a 1955 "Manifesto" ostensibly against nuclear war, but also aimed at preventing the spread of civilian nuclear power. In 1957, Russell's efforts coalesced around the Pugwash movement, named for the estate of Cyrus Eaton in Pugwash, Nova Scotia, where the initial meeting was held (and whose funding helped Russell's organizing). The focus was on opposing nuclear weapons, devising ways of monitoring for nuclear tests, pushing disarmament proposals, and later, opposing the Strategic Defense Initiative (which would have stopped the "arms race" that the Russellites supposedly wanted to end).

Instead of a flowering of the peaceful applications of nuclear power, the Pugwashers and their many satellite groups created a thriving and well-funded industry of watchdogs, legal analysts, professional negotiators, and political mumbo jumbo—the aim of which was to crush the development of civilian nuclear programs in South America, Asia, Africa, and the Middle East.

How were leading scientists drawn into this anti-technology movement? At the war's end, a faction of U.S. scientists and political figures fought—and won—the wresting of control of atomic energy from the military. The Atomic Energy Act of 1946 was made into law, setting up *civilian* regulation of nuclear energy.[2] But, within a few years, many of these same scientists, and their counterparts internationally, were captured by the Russellite movement.

The Attack on Atoms for Peace

From the beginning, the concept of "nuclear non-proliferation" was wielded as a weapon against the Atoms for Peace concept by the Utopians. They dropped the bomb on Japan at the end of the war not because it was militarily necessary—the Japanese Emperor had already agreed to surrender, as the United States knew through its back-channel negotiations via the Vatican—but in order to strike fear and terror in the rest of the world. The images of the needless devastation at Hiroshima and Nagasaki were burned into the consciousness of an already war-exhausted world population.

And so, at the direction of the Utopians, nuclear weapons came to be equated with nuclear power, which they wanted to restrict to themselves. Instead of Atoms for Peace, we had "non-proliferation of advanced technology," an approach mindlessly supported by many otherwise reasonable individuals in the name of peace. As we can see today in Iraq, Iran, and elsewhere, when nations are prohibited from developing the advanced technologies that enabled the industrial nations to raise their populations from grinding poverty to comfort, there cannot be peace.

Like schoolyard bullies, the Cheneyac Utopians in the Bush Administration associated with this policy of technology-prevention today, foolishly assume that in

the end, they will remain on top of the heaps of bodies and destruction they cause.

War and Malthusianism

Along with Russell's anti-technology proliferation policy, the scientific community adopted his Malthusianism. Thus, the so-called American Association for the Advancement of Science, today promotes the same old Russellite political garbage packaged in trendy academic verbiage. Its premier science magazine, *Science,* for example, devoted the Dec. 12 cover story to the "Tragedy of the Commons?" the idea that over-copulating, over-populating, over-consuming man is rapaciously using up an unalterably limited Nature.

The "Tragedy" cover title comes from a misanthropic scientist named Garrett Hardin, whose essay by that name appeared in *Science* 35 years ago. Hardin popularized the idea that the world was running out of resources fast, and that the United States should get rid of immigrants, increase infant mortality, and abort those who might end up costing society a lot of medical care. (True to his own beastly philosophy, Hardin and his wife committed suicide together Sept. 14, 2003, as faithful members of the Hemlock Society to the end.)

So, why is the leading U.S. science magazine devoting four weekly issues to discussing the role of science in "sustainability" (that euphemism for "how do we stop that beast, man, from killing Mother Nature")? And why are so many scientific society leaders such unabashed Malthusians? Several come to mind: Former AAAS President F. Sherwood Rowland, the pompous fabricator of the ozone hole; Lynn Margulis, the current president of the scientific research society Sigma Xi, a Gaian who defines "human overpopulation and loss of nonhuman lives" as the crucial issues; Rita R. Colwell, former Sigma Xi president and now Director of the National Science Foundation, who in one Washington, D.C., speech this writer attended compared the growth of human population to bacteria in a petri dish, dying out when a certain critical point is reached.

For the Malthusian, war, pestilence, poverty, and disease are *beneficial*. As Bertrand Russell wrote about it, these were means of culling the undesirable population.

As heinous as this Malthusian anti-population view seems, it has been U.S. policy for 30 years, albeit secretly for most of that time. Its existence came to light in 1991, when the 1974 National Security Study Memorandum 200, issued during the Ford Administration, was declassified. In this Memorandum, then National Security Advisor Henry Kissinger lays out the dangers of population proliferation in 13 key Third World nations—including India, Bangladesh, Pakistan, Nigeria, Mexico, Indonesia, Brazil, Egypt, Colombia.

Why? For the same underlying reasons that the Bush Administration adopted its policy of pre-emptive nuclear war: An increase in population might threaten the cheap strategic materials supplies that Kissinger et al. thought should belong to the Anglo-Saxon Empire, and an utter disregard for the lives of human beings.[3]

Either we return to Atoms for Peace, or we face perpetual war and further descent of the world into a new Dark Age. Contrary to the lily-livered members of the nuclear industry who are afraid to promote the technology they have devoted their lives to, contrary to the backers of Vice President Cheney's "preventive nuclear attack" policy, and contrary to the Russellite dupes of the anti-nuclear "peace" movement—development of nuclear power and advanced nuclear technology shared with the nations of the world is the *only* way to establish peace on Earth.

—Marjorie Mazel Hecht

Excerpts from Eisenhower's Atoms for Peace Speech, Dec. 8, 1953

". . . My country's purpose is to help us to move out of the dark chamber of horrors into the light, to find a way by which the minds of men, the hopes of men, the souls of men everywhere, can move forward towards peace and happiness and well-being. . . . To hasten the day when fear of the atom will begin to disappear from the minds of the people and the governments of the East and West, there are certain steps that can be taken now. I therefore make the following proposal: The governments principally involved, to the extent permitted by elementary prudence, should begin now and continue to make joint contributions from their stockpiles of normal uranium and fissionable materials to an international atomic energy agency. We would expect that such an agency would be set up under the aegis of the United Nations. . . . The more important responsibility of this atomic energy agency would be to devise methods whereby this fissionable material would be allocated to serve the peaceful pursuits of mankind. Experts would be mobilized to apply atomic energy to the needs of agriculture, medicine, and other peaceful activities. A special purpose would be to provide abundant electrical energy in the power-starved areas of the world.

"To the making of these fateful decisions, the United States pledges before you, and therefore before the world, its determination to help solve the fearful atomic dilemma—to devote its entire heart and mind to finding the way by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life."

Notes

1. One of many examples was a speech Russell gave to the Royal Empire Society in December 1947 on "The International Bearings of Atomic Warfare." in which he stated: I should like to see as soon as possible as close a union as possible of those countries who think it is worth while to avoid atomic war. I think you could get so powerful an alliance that you could turn to Russia and say, 'It is open to you to join this alliance if you will agree to the terms: if you will not join us we shall go to war with you.' I am inclined to think that Russia would acquiesce; if not, provided this is done soon, the world might survive the resulting war and emerge with a single government such as the world needs."
2. This is discussed in the book of nuclear reminiscences by Theodore Rockwell, ***Creating the New World: Stories and Images from the Dawn of the Atomic Age*** (Bloomington, Ind.: 1st Books, 2003).
3. See "U.S. Declassified Its Depopulation Policy," by Joseph Brewda, ***21st Century,*** Summer 1991, p. 10)

Letters

Interstellar H_2 Explains Redshift

To the Editor:

I read the article "Discovery of H_2 in Space" by Paul Marmet (Spring 2000) with great interest. But since then I have not seen that this discovery has been seriously discussed in the science press. Has this discovery been totally ignored or is something happening in the science world? I should appreciate some follow-up.

Lars-Olof Johansson
larsolof.j@finspong.com

Paul Marmet Replies

The amount of H_2 discovered in the universe is still increasing exponentially. According to astrophysicists, Valentijn and van der Werf, "Dark matter in galaxies may not be so exotic or even very dark, it may be ordinary molecular hydrogen (H_2)." Furthermore, as reported recently in *Nature* (June 24, 2003), measurement shows that a a single newly observed quasar, with a redshift of 6.42 (when our universe was only 850 million years old), contains 20 billion solar masses of molecular hydrogen.

Therefore, nobody can claim that there is not enough hydrogen in space to produce the observed redshift. More discoveries of H_2 are highly expected. Sooner or later, astrophysicists will have to take into account all that hydrogen in space, which has been demonstrated to produce a redshift identical to the assumed cosmological Doppler redshift.

Paul Marmet
paul@marmet.ca

We Do Need to Burn the Texts and Re-create Science

To the Editor:

Thank you for your editorial on "Cosmic Humbuggery" in the Fall 2003 issue of *21st Century Science & Technology*. I am a fan of [physical chemist William Draper] Harkins and appreciate your report. This will be helpful in the memoirs I am writing on "My Journey to the Core of the Sun."

Unfortunately, LaRouche is right: we do need to burn the textbooks and re-create science. I suspect that federal research grants and the system of anonymous reviewers have essentially destroyed science.

Enclosed are copies of one paper recently published on the composition of the Sun,[1] and another in press on climate and solar eruptions.[2] Last summer's hot weather in Europe finally focussed their attention on the reasons for unusual climate.

Unfortunately that was not true in 2001, when I presented papers at the SOHO/ACE Workshop in Bern, Switzerland on 6-9 March 2001, and at the Asteroids 2001 Conference in Santa Flavia (Palermo), Italy on 11-16 June 2001. Both papers were censored from publication in the conference proceedings.

Oliver K. Manuel,
Professor and Former Chair
Dept. of Chemistry
Univ. of Missouri at Rolla

Notes

1. O. Manuel, S. Friberg, "Composition of the Solar Interior: Information from Isotope Ratios," www.umr.edu/~om/abstracts2002/soho-gong2002.pdf
2. O. Manuel, B. Ninham, S. Friberg, "Superfluidity in the Solar Interior: Implications for Solar Eruptions and Climate," *Journal of Fusion Energy*, Vol. 21, Nos. 3/4 (Dec. 2002)

Anti-Gravity and The Ampère Force

We reprint here a correspondence between Vincent Morin, author of the Research Communication "A Puzzling Current Loop" (Spring 2003), and a critic.

Dear Mr. Morin:

I read your article in the Spring 2003 issue of *21st Century*.

I fight to no victory with editors/peers permitting any *measured* loss of weight to be a result of "anti-gravity," as claimed by many authors/experimenters.

Though you made no direct claim, your wording implied same.

Anti-gravity cannot exist, as it would self-destruct in the first place. The anti-effect of gravity would be a one way push-out force (i.e., pull-in vs. push-out).

As to your experimental results, I cannot specifically show why the measured "loss of weight" occurred. I do have two clues that I believe would show the cause. The first is the Faraday longitudinal force, and the second, its proof of the Ampère hairpin wire experiment. However, there are still arguments over these, so that is why I cannot make any claims as to certainty.

Personally, I believe such must exist, otherwise the left-hand/ right-hand rule could not exist. That is, there must be a longitudinal vector (force/effect) to another vector in order to give the results.

As to no antigravity, I have a standing reward of U.S. $2,000 to the first person that can show where such a force can exist. I can only refer you to my web site at (no www.) http://web2.airmail.net/nptbs. . .

I do not expect any reply.

Bert Schreiber
Bellaire, Texas

P.S. A common balloon filled with a lighter gas has this equivalent "weight loss"; that is not so. The *absolute* weight of the balloon and gas does not change. It is the effect of the *mechanical* forces (Archimedes Principle) involved that permit the balloon to rise "against gravity." Vast difference! By the same token, it could be said to have a "negative weight," just as well. But that is, of course, a physical impossibility. The correct wording is "apparent measured."

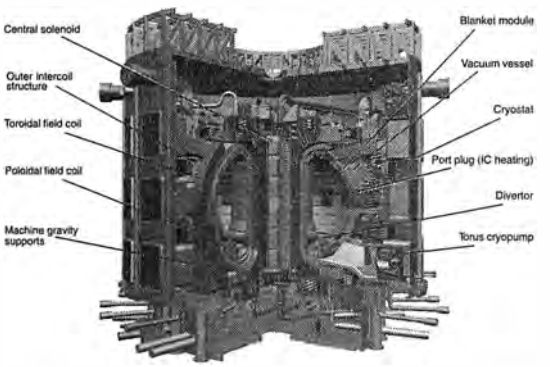
Vincent Morin Replies

It would be less than honest scientifically to answer in brief. *21st Century* kindly accepted the short communication you refer to, and at the time I was very surprised at a result for which I had no explanation, after some months and several different suggestions.

Recently, I have found a non-obvious flaw in the measurement set-up: it appears that the balance I used reacts to a horizontal tangential force as if a negative weight change had occurred. I still have no precise explanation for this, because the manufacturer, Sartorius, did not give me any indication of the balance mechanism. (I am unwilling to dismantle such an expensive piece of equipment.)

This kind of balance is very stiff, so that very small displacements are associ-

Continued on page 17



International Atomic Energy Agency

The second-generation engineering design for ITER, will be capable of generating 500-megawatts of power for up to 10 minutes, and could lead to the construction of a demonstration fusion power plant.

INTERNATIONAL FUSION PROJECT, ITER, MOVES CLOSER TO REALITY

The proposed European site for the $8 billion project to build a tokamak-type fusion power reactor is Cadarache, France, according to a Nov. 26 decision of the European Union's research ministers. The experimental device, known as the International Thermonuclear Experimental Reactor (ITER), will produce power from the thermonuclear fusion of heavy hydrogen isotopes, abundantly available from sea water. The ITER partnership also includes Canada, Japan, Russia, and the United States. Canada and Japan have also made proposals for sites. The final decision on location is expected to be made around the end of 2003.

15 MILLION ETHIOPIANS AT RISK OF MALARIA; BRING BACK DDT!

The United Nations News Service reported Oct. 22 that "As many as 15 million Ethiopians face the threat of dying from malaria before the end of this year," and said that the U.N. Children's Fund (UNICEF) and the World Health Organization had called for more funds for malaria drugs.

Not mentioned is the fact that both these organization oppose the use of the pesticide DDT, which has been proven to stop the spread of malaria, simply by spraying a small amount on the inside walls of dwellings. (For more about how DDT stops malaria, see *21st Century*'s special DDT reprint collection, available for $15 from *21st Century* by mail, or at the website store.)

RUSSIA WILL BUILD FIRST FLOATING NUCLEAR POWER PLANT

Russia may build the first floating nuclear power plant in as little as three years, Atomic Energy Minister Aleksandr Rumyantsev said in an interview with ITAR-TASS on Dec. 17. The State Chief Export Commission of Russia recommended a Rusenergoatom design for a prototype floating nuclear power plant, to be constructed either on a barge near Severodvinsk in the Archangelsk region, or at a Petersburg shipyard. The project aims to improve the energy supply in regions along the Arctic Sea Route.

Rusenergoatom's Nov. 11 press release said that the price of electricity generated by a floating plant will be half that from conventional plants using gas or coal. According to the press release, the cost of the prototype plant will be about $180 million, with a payback period of 13 years. The prototype is a 70-megawatt reactor, similar to those in Russian nuclear submarines.

Russia has two other designs for floating nuclear plants, one in the Kamchatka region, and another on the Chukotskoi peninsula. A miniaturized model of the floating plant is on display at an ongoing Russian high-tech exhibit in Philadelphia.

H.S.M. ("Donald") Coxeter with his youngest great-grandchild, shortly before his death. The placard reads: "Life is not meant to be endured—it is to be celebrated."

GEOMETER H.S.M. COXETER DIES, AT AGE 96

21st Century mourns the loss of Prof. Harold Scott Macdonald ("Donald") Coxeter, who died peacefully in his Toronto home, at age 96, March 31, 2003.

Socrates chastised the geometers for failing to examine the deeper axioms embedded within their systems. The project of Coxeter and John Flinders Petrie to construct a fourth dimension by analogy to the projective properties of the third into the second, encountered such difficulties. But, even a flawed geometry may be better than none at all, or than the wildly algebraic construct known as n-dimensional space. Coxeter's *Regular Polytopes* has been a useful reference for collaborators of *21st Century* working in the field, as was his encyclopedic knowledge, always offered freely and with encouragement.

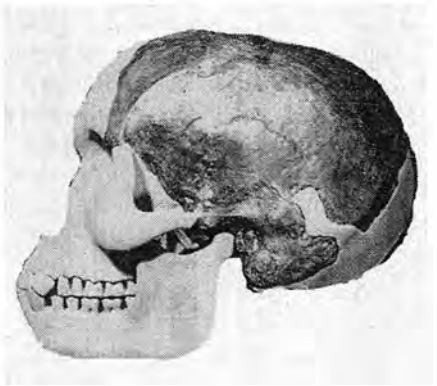
According to his daughter, Susan, Donald was both a talented mathematician and pianist. At about age 14, his parents took him to Bertrand Russell, to enquire which way to go with his life. Russell advised them to have the boy study mathematics and pursue piano as a recreation, which he did. Russell did not believe in the soul. We who do, hope that the two shall not meet.

EXPOSURE OF 'PILTDOWN MAN' HOAX COMMEMORATED IN BRITAIN

The 50th anniversary of the exposure of the Piltdown Man hoax, which cast suspicion on such well-known authorities as Sir Arthur Conan Doyle and anthropologist-theologian Teilhard de Chardin, will be commemorated with a special exhibit at the Natural History Museum in London, and presentations at the annual Science Forum, according to *The Scotsman,* Dec. 2.

The Piltdown "fossils" will be on display for the first time since the hoax was exposed in 1953. The Piltdown Man fossils, "found" in 1912, allegedly showed the missing link between human beings and apes. When it was discovered to be a hoax—parts of an ape jawbone and human skull, tinted brown to make them look old—the science textbooks had to be rewritten.

As the museum's head of the human origins division, Prof. Chris Stringer, noted: "Fifty years on, we can see why it happened the way it did and why it lasted so long, why it was that Britain was ready for this discovery. We have to learn the lesson that just because something suits your preconceived ideas doesn't make it true."



"Piltdown man": the hoax of the missing link between ape and man that had British scientists fooled for 50 years.

INDIAN SPACE PROGRAM, PRIDE OF THE NATION, TURNS 40

Forty years ago, on Nov. 21, 1963, India launched its first rocket from a small fishing village. It reached an altitude of 660 feet. A local church was turned into an office for the scientists, and the launch pad was erected among coconut groves, near Trivandrum, state capitol of Kerala. The chairman of India's Space Research Organization, G. Madhaven Nair, announced on the anniversary that India would launch 40 remote-sensing satellites, by 2008. The Indian government recently approved sending a scientific probe to the Moon within two years.

MONTREAL PROTOCOL SIGNERS DEFER DECISION ON METHYL BROMIDE BAN

Representatives of 180 government signatories to the 1987 Montreal Protocol on Substances That Deplete the Ozone Layer, meeting in Nairobi in November, deferred a decision on the date for banning methyl bromide, a widely used agricultural fumigant essential for many crops. There are no effective replacements for methyl bromide, which is applied to the soil to kill pests before crops are planted. Suggested substitutes are ineffective. One of the U.S. delegates, a representative of California's strawberry growers, said that he suffered an 80 percent drop in production when he tried one of the alternatives.

Why ban methyl bromide? In the magical, well-funded world of professional enviromentalists, methyl bromide is a powerful demon that makes the ozone hole grow, and allows excess populations to eat fruits and vegetables.

ROCKET PIONEER ARTHUR RUDOLPH RECOGNIZED AT INT'L SPACE CONGRESS

The story of the man who managed the Saturn V rocket program that put men on the Moon, was presented by Marsha Freeman at the 54th Congress of the International Astronautical Federation, held in Bremen, Germany, at the end of September.

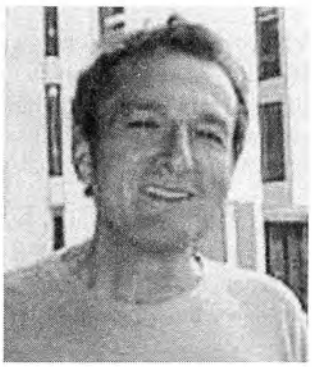
Rudolph, one of the members of Wernher von Braun's "rocket team," made his first contributions to space technology in the early 1930s, designing a successful liquid-fueled rocket engine. Once in the United States, he managed critical Army rocket projects, and then led the development of NASA's huge Apollo Saturn V.

In later years, Rudolph was falsely accused by the Office of Special Investigations of the U.S. Justice Department for alleged "Nazi" crimes, but he was exonerated by the government of then-West Germany.

Martha Rudolph

Space pioneer Arthur Rudolph with 21st Century Associate Editor Marsha Freeman, in 1994.

The Truth about Mosquitoes and Global Warming



Courtesy of Tech Central Station

by Paul Reiter, Ph.D.

On his July 2003 trip to Africa, President George Bush paid homage to the tens of thousands of slaves who were held in pens on tiny Goree Island, Senegal, before shipment to the United States. As he stepped ashore, he must surely have seen a marble Madonna, a memorial to 29 medical personnel who died in a terrible yellow fever epidemic in 1878.

Typical tragedy of the tropics, you may say. But wait. If you go to Elmwood Cemetery in Memphis, Tennessee, you will see a huge mound, a mass grave into which thousands of bodies were piled during the devastating yellow fever epidemic of 1878. There were 100,000 cases in the United States that year, 19,500 in Memphis alone. The mosquito-borne pestilence moved by riverboat and railroad, from New Orleans to Ohio. Memphis was destroyed, and has never regained its position as capital of the South.

The 1878 epidemic fascinates me because I am a specialist in the ecology and epidemiology of diseases transmitted by mosquitoes. Malaria, dengue, yellow fever, St. Louis encephalitis, West Nile encephalitis, that sort of thing.

So, I am not a rocket scientist, and if I were to write articles on rocket science it wouldn't be surprising if people didn't take me seriously.

However, perhaps it is surprising that the reverse isn't true.

My field has a small number of specialists, so we tend to keep contact with each other. About 12 years ago, we were piqued to see a growing number of articles that were in our field but were written by persons we had never heard of. Some were even rocket scientists!

The articles had a common theme: "Global warming" is a threat to human health; it will cause major increases in the transmission of mosquito-borne diseases; the diseases will spread to new latitudes and altitudes around the world; and the process has already begun.

Nearly all the articles exploited common misconceptions: mosquito-borne diseases are "tropical," hot weather and heavy rainfall mean more mosquitoes, mosquitoes die if the weather is cold, and more mosquitoes mean more infections.

Abject Misinformation

Despite their abject misinformation, their impact was increasingly obvious, not only in the popular press, but also in the prognostications of influential panels of "experts." For example, the Second Assessment Report on the Impacts of Global Change published by the United Nations Intergovernmental Panel of Climate Change (IPCC) devoted more than a third of its chapter on human health to discussion of the mosquito-borne diseases. Neither the nine lead authors nor the sources they cited were specialists in the field. Nevertheless, their authoritative pronouncements gave authenticity to a new crop of erroneous articles, many with inventive explanations of new situations.

A good example was a *Scientific American* cover story, "Global Warming: The Hidden Health Risk," that appeared in August 2000. The bulk of the article gave all the usual examples, but there was also an extensive discussion of the disease of the moment: West Nile encephalitis in the United States. The gist was that global warming had exacerbated the proliferation of this mosquito-borne virus after its accidental introduction in 1999. The initial factor had been the warm winter of 1998-1999, which had increased the survival of the Common House Mosquito, *Culex pipiens,* one of principal suspects, and had thus helped the virus to proliferate in the New York area.

To the layman this might sound totally plausible, but is there really evidence that *Cx. pipiens* survives better in warm winters?

Every week through the winters of 1981-1982 and 1982-1983, I crouched

Mosquito misinformation in the service of global warming.

my 6-foot-plus frame through 465 yards of a 5-foot diameter Memphis storm sewer, counting the adult *Cx. pipiens* that were sheltering there. I had marked them with fluorescent powders in the late fall.

I endured this routine to determine their survival rate—the species is also important in the transmission of another virus, St. Louis encephalitis.

Fortuitously, the first winter was bitterly cold, with temperatures down to zero degrees Fahrenheit, but the second was affected by an El Niño event—you could dance outdoors some nights in December.

My travails showed that the survival rate was high and was the same in both winters. There was no hint of increased mortality during colder spells. Indeed, on a morning after zero degree weather, I collected females from a culvert where they were totally exposed to the cold. They were surrounded by ice, and I suspected they might be frozen and dead, but before I had warmed up in the cab of my pick-up, they were buzzing happily in their tube!

National Library of Medicine

Franklin, Louisiana, 1898: A temporary yellow fever hospital in a swampy area near the Gulf coast. Thousands of Americans died from yellow fever during the epidemic of 1878 and subsequent outbreaks.

Mosquito Anti-freeze

Mine is the only study of its kind. The results were not surprising: as with many insects, adult *Cx. pipiens* have a natural anti-freeze that protects them through the winter—Incidentally, the 1998-1999 winter was much colder in Volgograd (formerly Stalingrad) than in New York, but the human toll from West Nile virus was much higher in Volgograd. Unlike Hitler's army, *Cx. pipiens* is comfortable in the Russian winter!

The same *Scientific American* article made extensive claims about malaria moving to new altitudes in the tropics. And the same author has stated in other publications that a 1993 outbreak of yellow fever in the Tugen Hills, western Kenya was the result of *Aedes aegypti*, commonly known as the Yellow Fever Mosquito, moving to higher elevations because of global warming.

That claim particularly bugs me because I led the World Health Organization team of entomologists that investigated that outbreak. To identify the mosquitoes involved, we sat for 19 consecutive days, morning and evening, catching the mosquitoes that came to bite us. It was a tiresome job, but it was the only way we could collect the relevant species, because they are not attracted to lights and they bite only primates.

We isolated the yellow fever virus from two forest species, *Aedes africanus* and *Aedes keniensis*. Our epidemiologists confirmed that this was a classic "sylvatic" outbreak, transmitted by mosquitoes between monkeys in the forest. The only human victims were people who got bitten when they ventured into the forest—honey gatherers, charcoal makers, and women taking water from the streams. *Ae. aegypti*, the usual suspect in towns and villages, was not present in the area!

Thus the yellow fever claim was pure fiction. Moreover, the *Scientific American* article included statements that *Ae. aegypti* had transmitted dengue fever at new altitudes in Mexico and Costa Rica, and had ascended to new altitudes in Colombia and India. These too were fantasy: The professional reports on these issues unequivocally stated that there was nothing surprising about the altitude at which they occurred. Of course, there was no mention of yellow fever in the U.S. in 1878!

The sad fact is that there is little we scientists can do to challenge this campaign of disinformation. None of us denies that temperature is a factor in the transmission of mosquito-borne diseases, and that transmission may be affected if the world's climate continues to warm. But it is immoral for the political activists to mislead the public by attributing the recent resurgence of these diseases to climate change, particularly in Africa.

The true reasons are far more complex, and the principal determinants are politics, economics, and human activities. A creative and organized application of resources to change the situation is urgently needed, regardless of future climate.

Paul Reiter worked for 22 years as a medical entomologist for the Division of Vector-Borne Infectious Disease of the Centers for Disease Control and Prevention (CDC). He now heads a new unit of Insects and Infectious Disease at the Pasteur Institute in Paris.

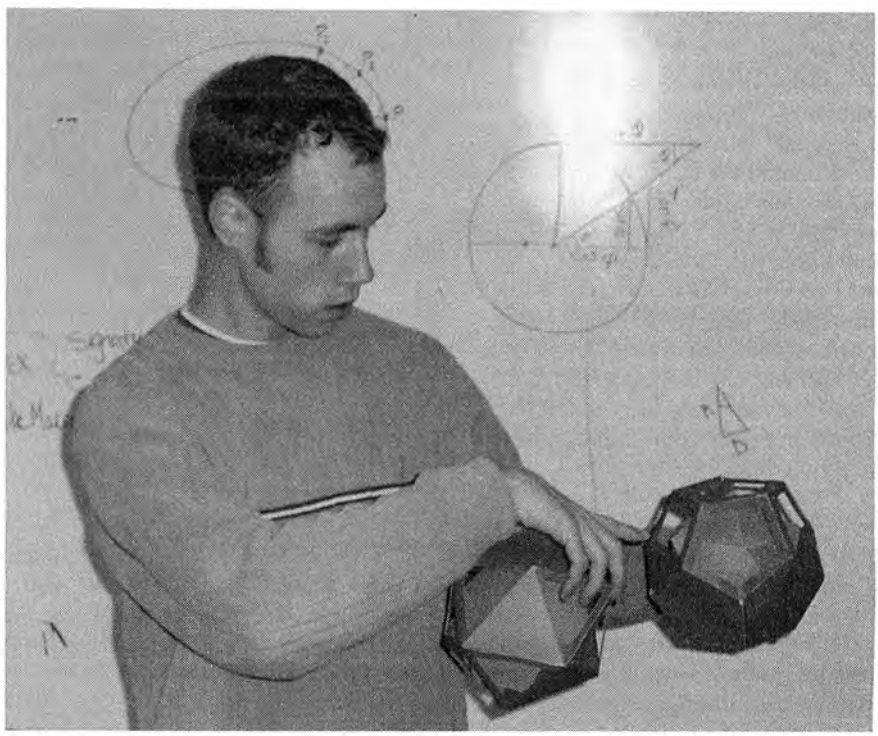
This article is reprinted with permission from Tech Central Station (http://www.techcentralstation.com), where it appeared August 6, 2003, under the title "Fever Pitch."

How to Win Gauss and Influence History

by Peter Martinson

Nobody joins Democratic presidential candidate Lyndon LaRouche's International Youth movement out of the fear of an impending global economic dark age, or the fear of a Dick Cheney threatening to shoot a few nations with nuclear weapons, or the fear of the rapidly surging outbreak of global pandemic diseases. These things are, of course, something to be a little scared of, and there's something wrong if you are not concerned, but nobody joins this revolutionary movement simply to stop these processes. We wouldn't succeed if that were our goal (which was the secret to the failure of the anti-war movements).

Similarly, nobody joins because some youth organizer tells them, that their university education is worthless, or that they probably won't get a job after college (although both are true, and we should not hesitate to make these points clear). Recruitment does not occur out of fear, in general. Youth (and baby boomers!) join this movement because they want to *build* a future, they want to know that their development is crucial to the progress of civilization.



The author, Peter Martinson, points to an icosahedron inscribed in a dodecahedron, in a pedagogical class for the LaRouche Youth Movement in Seattle.

To this end, Lyndon LaRouche, our adopted teacher, has laid out the educational curriculum for his youth movement, in several hundred speeches, dialogues, and papers over the past year and a half: We must master Carl Friedrich Gauss's 1799 paper, on his proof of the Fundamental Theorem of Algebra! We must understand, not only the construction of his proof of the theorem, but also his critique of the other mathematicians of his time, and the historical significance of this act of courage and genius.

Science and the YOUTH MOVEMENT

What you are reading right now is intended to be an aid for (1) the current youth organizers in understanding the paper itself (and why our fearless leader has decided to torture us with it!); (2) non-members, to see what this movement is about, and why they must drop everything and join immediately, and; (3) future citizens of the universe, living in Berlin-sized billion-person cities on Mars, as a document of the construction of a youth movement. We will look at how a youth organizer, the author, actually went about understanding Gauss's paper, on the background of the ongoing investigation of this paper by the Seattle, Washington LaRouche youth, who still don't quite understand it.

Let's talk about me for a moment. I am 25 years old, and have been a LaRouchie since the beginning of 2002. I have a heavy university background in mathematics, astronomy, and physics, and was just starting graduate school when I ran into this organization. As soon as I saw the fanatical devotion to scientific breakthroughs, discoveries, and starting a global renaissance, I freaked out, because I didn't see that in school.

For example, one of the organizers, at an after-meeting bread and wine get-together, asked me why the water in the toilet swirls in one direction in the Northern Hemisphere, and the other direction in the Southern Hemisphere. After about 15 minutes in front of the white board, with diagrams showing some of the mechanics of orbiting bodies, and other things to demonstrate the Coriolis effect, I realized that all side conversations had stopped, and the entire Seattle LaRouche movement was staring intently at the diagrams.

Then they started firing high level questions at me about why the rotational velocity of a falling object is conserved, how this changes with latitude, and so on. I reflected back to an after-school party of the University of

Washington Astronomy Department, where it was demanded several times, that work was over for the day, and discussion of the Universe should be limited to dumb jokes about co-workers.

I soon dropped out of school, and never looked back. My "education" has provided me with some useful tools, and a certain comfort with mathematical work, but I've found it more of a burden than a help, as we will see later on in this report.

Upon Reaching 'Page 1'

In early summer 2003, at my second Los Angeles Cadre School, I was able to ask Lyn [LaRouche] a question: "Why did Kepler decide to put the planetary orbits between nested Platonic Solids? I mean, what was he thinking?"

I didn't understand much of his answer, where he talked about the "apparent self-evidence of the counting numbers," but took notes diligently. What I did understand, was that he used my question to demand, as he did for virtually all other questions, that we look at Gauss's proof of the existence of the Complex Domain.

Later on, Jonathan Tennenbaum talked to the growing number of Los Angeles youth, about studying seriously the work of one of the great scientists of the past. Midway through the discussion, he asked why we believed that $(a + b)^2 = a^2 + 2ab + b^2$. He said, if you don't understand why this is physically true, then you're just memorizing rules. He then drew a square on the board, with side length $a + b$, with two lines drawn inside, cutting the square into four smaller boxes, of areas a^2, ab, ab, and b^2 (Figure 1). Here, my science crony Riana had an elated fit, after seeing how easy it was with geometry, as opposed to the years of grill-and-drill with formulas. This event proved to be a key in our work with Gauss's actual paper, which Jonathan again emphasized several times.

Back in Seattle, several of the 6 youth (now 20) tried to take up this challenge, not by reading Gauss's paper, but by plowing through, mostly individually, two of Bruce Director's pedagogicals on the proof. What Bruce said Gauss was proving seemed simple enough to most of us: An equation has as many solutions, as the number of times the highest powered variable is multiplied by itself.

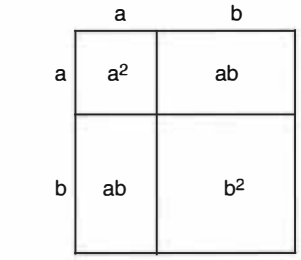


Figure 1
WHY DO YOU BELIEVE
$(a + b)^2 = a^2 + 2ab + b^2$?
If you don't understand why this is physically true, than you are just memorizing rules.

In other words, an equation where the highest power is x^3 has three solutions, and an equation with x^4 has four solutions, and so on. This is the Fundamental Theorem of Algebra.

Part of Gauss's paper, according to Bruce, was a refutation of previous proofs of the Fundamental Theorem of Algebra by people like d'Alembert, Euler, and Lagrange. What is the difference between two explanations of a phenomenon? If both explain the observations equally well, how can you tell if one is "more right" than the other? The problem Gauss was dealing with, as far as we knew at the time, was that, when your equation looks like $x^2 + 1 = 0$, either you have no solutions, or you invent a new type of number, $\sqrt{-1}$. And, why not? Did *God* invent the regular counting numbers, or did human beings? Everybody who had tried proving the Fundamental Theorem of Algebra before Gauss, had used this so-called "imaginary" number, so that their proofs would work. Gauss also defended the use of this number, according to Bruce.

Bruce's pedagogicals stressed the importance of geometry, or, in other words, physics. Apparently, Gauss proved the Fundamental Theorem of Algebra using geometry, while the others proved it using algebra. What was the difference? This was the slippery question for me. For example, Kepler asked, if Ptolemy, Copernicus, and Brahe had models that predicted the orbits of the planets equally well, which one is "correct?" Can one answer this question? Did Bush invade Iraq because of Oil, Pops Bush, the war on terrorism, or the Illuminati? Does Truth exist?

One of the most common responses we get to LaRouche's ideas, is, "Well, that's just your opinion. You have your reality, and I have mine!" I e-mailed Jonathan with this question, and he replied, roughly, "first, you must look at what types of hypotheses benefited humanity throughout history, and, second, you must read Gauss's original paper!" This was actually the first major discovery—don't accept anyone's word for proof, but go to the original source. Use the pedagogicals, or LaRouche's writings as a guide, but dig into the actual writings of the scientist.

So, Riana printed off a copy of the paper from the internet.[1], and we began looking at it. The title is: "New Proof of the Theorem That Every Algebraic Rational Integral Function in One Variable Can Be Resolved into Real Factors of the First or the Second Degree." And it gets worse.

Swimming in Formalism

Riana and I quickly found that most people in the world have a neurotically adverse reaction to the algebraic manipulations of symbols and formulas. Some people have an opposite, neurotic compulsion to algebraically manipulate symbols and formulas on sight, like me. Neither is a healthy, natural state for a human being to remain in.

After poking around individually in the paper, we got serious, and started meeting once a week in a group, to start from the beginning, and try to make progress. I quickly found that I was to take the main role of teacher for this project. Gauss assumes a lot of the reader—he was actually writing for an audience of contemporary mathematicians. He starts out by saying, "Every determined algebraic equation can be reduced to the form

$$x^m + Ax^{m-1} + Bx^{m-2} + \ldots M = 0$$

such that m is a positive integer." We assumed that one must work through the whole paper, from beginning to end, in a straight line, and so began algebraically moving symbols around to demonstrate, empirically, that every crazy equation one can think of, can be rearranged into this general form.

In fact, most of our activity in the early parts of the paper was this type of manipulation of symbols, to the dismay

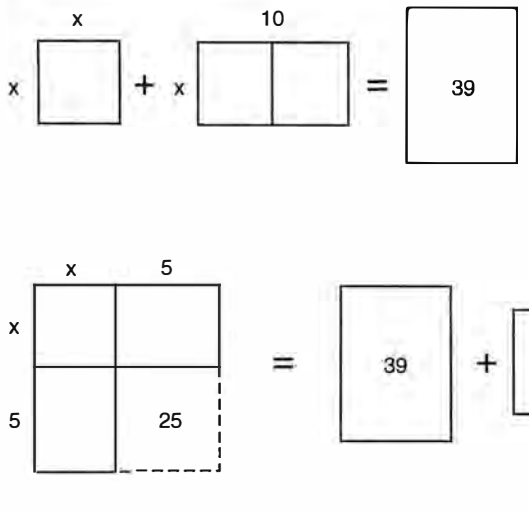


Figure 2
AL-KHWARIZMI'S SOLUTION OF A QUADRATIC EQUATION
During the Baghdad Caliphate in the 8th century B.C., Al-Khwarizmi constructed the solution to $x^2+10x=39$. First, he took a square, of side length x, and a rectangle of sides 10 and x, and set the total area equal to 39. Next, he cut the 10x rectangle into two pieces, and stuck them onto the square, making an L. To fill in the "defect" in the large square, he added an area of 25, and added 25 to the 39 on the other side of the equation. Thus we have a square of side length 5 + x, equal to a square of area 64. So, x = 3.

of the others. Didn't we join this movement to make discoveries, not just perform learned tricks? Where was the geometry that Bruce was so excited about? To justify the algebraic gymnastics, we tried following Jonathan's model from Los Angeles, to actually derive some of the rules from geometry.

For instance, the so-called "distributive property" comes from a rectangle made of two smaller ones—one side length is *a*, the other side length is *b + c*. Multiplying to find the areas, one finds that $a(b + c) = ab + ac$. You can extend this to $(x + a)(x + b) = x^2 + (a + b)x + ab$, which is a needed tool for the beginning of the paper.

Science and the YOUTH MOVEMENT

But, it was still tedious. Todd, our tweener, pointed out that, when making discoveries, you have to root out the bad axioms in your head. So, according to him, we actually had to work through all this tedium, so we would remember how crazy it was, when we actually got to Gauss's proof. Through the manipulations, we did figure out why the textbook proof is wrong, and other things, like that the "real factor of the second degree" referred to in the title, meant a product of two factors made of complex conjugates $(a + bi)$, and its conjugate, $(a - bi)$. Multiplying them together gives $(a^2 + b^2)$, and we started poking through d'Alembert's proof, and Gauss's refutations.

Todd and the others kept pushing me to lead them through the algebra, but, I hated it! I felt that I was not only just performing the animal-like tasks I was brainwashed with in college, but that I was contributing to the brainwashing of my friends. For example, the first proof that Gauss refutes, the "textbook" proof, requires the manipulation of "systems of equations." These are several equations, related through their variables, that you can subtract, add, substitute, and otherwise manipulate, so you are left with an equation with just one variable, for which you can then solve. But, not really, as Gauss shows—it's just circular logic.

To get to this point, though, requires a lot of algebraic gymnastics! How can I tell my "students" to follow my lead, as I don't know myself if these manipulations are valid? I memorized the rules, and got good grades for it! I never found out why the rules were true! After a lot of frustration, we agreed to look at Gauss's proof, instead.

Gauss starts out with two "lemmas," or preconditions, which are quite wild. Here, he introduces equations that look like they are in another dimension of complexity, with sines and cosines, and new Greek letters. I remembered back to some of my math classes in college, when we were looking at complex numbers as positions on a two-dimensional Cartesian grid, and thus, one can describe the position either with two rectilinear coordinates (like the *x*- and *y*-axes), or by an angle away from the horizontal and a distance (so-called polar coordinates).

From this, we figured out that $xx - 2\cos(\phi)rx + rr$ *was actually the product of factors made of the two complex conjugates, in "polar form," multiplied together. I remember my first brush with these trigonometric functions in high school, wondering what the sin, cos,* and *tan* keys were on my calculator. Upon having asked a jerk teacher, I got the answer, "Well, it's just *soh cah toa!*" Just another damn mnemonic device for remembering the formulas for the relationship between the legs of a right triangle, and its angles. Nobody wanted to get lost in the muck of the algebra of trigonometric functions, which was just another, much more horrible version of algebraic formalism, so we decided to figure out what trigonometry really was, instead.

Circular Action, Not Circular Logic

Unfortunately, we have a huge global problem: the economic collapse physically means, the threatened reduction of the world population by about 5 billion people, in the next few generations. This is what LaRouche says, and it's difficult to refute the most successful economic forecaster in modern history. Thankfully, he's also an expert in posing solutions to huge economic problems. Sadly, nobody in power, or virtually anywhere else, has his kind of intellect.

So, we've decided to take the responsibility to become geniuses in political economics, too, and recruit more people to this mission. Therefore, we devel-

oped a pretty rigorous weekly schedule: on Monday, after organizing, we would work through one of the pedagogicals written by either Bruce or Jonathan; on Wednesday, we would have our political meeting, with a class given on some interesting subject; on Thursday, we would work on our Bel Canto chorus; on Friday, we would work on LaRouche's economics textbook; on Saturday, we would have another political meeting; and on Sunday, we would read some of Friedrich Schiller's letters on the "Aesthetical Education of Man," and a Platonic dialogue. All other time was consumed recruiting the population to the fight.

This recruitment was directly into a work-in-progress. After each cadre school, to which we would try roping in large numbers of college-aged potential revolutionaries, several people would join the LaRouche movement full-time. I thus found myself regularly with new people sleeping on my couch, wanting to also "learn Gauss," and start a world American Renaissance.

Since diving straight into Gauss's paper usually just produced the glazed eyeballs of death, we found ourselves going back to Bruce's original Gauss pedagogicals regularly. Thus, we made little forward progress on the paper. But, I was becoming more and more concerned with, what was LaRouche's point, in having us study this paper? We had pretty much stopped working on the actual paper, and were now concentrating on other things, like pedagogicals, organizing a crazy population, and so on.

But, LaRouche kept hammering at us to understand this thing, from the standpoint that it wasn't just a dry academic work, but something special. For example, why have a political youth movement study some remote, buried work 200 years old? Shouldn't we instead study political youth movements of the past? We had acquired a few new tools to go after what the meaning of the Gauss paper was, employing the help of several older members of the organization.

Larry Hecht pointed out that what Gauss was getting at, wasn't necessarily limited to algebraic equations and $\sqrt{-1}$. Try something "easier," like $\sqrt{2}$. How big is that? We learn in school that it's just your average, never-ending decimal. No matter how far past the decimal point you calculate, you still have an "infinite" number of digits left to calculate. Is that true? Putting the radical sign over the 2 is just like taking a problem, and putting a bag over it, so you forget you had a problem there.

What is a "square" root? Does this thing even exist? It's definitely not a number that you can "count up to." Can you construct it?

Flying around the U.S.A. to give classes on Gauss's proof, Bruce Director was bewildering us with talk of powers, geometric and arithmetic means, logarithmic spirals, catenaries, and so on. The one thing that blew me away, though, was when he showed how, during the Baghdad Caliphate in the 8th Century B.C., Al-Khwarizmi constructed the solution to $x^2 + 10x = 39$.

He took a square, of side length x, and a rectangle of sides 10 and x, and set the total area equal to 39 (Figure 2). He then cut the $10x$ rectangle into two pieces, and stuck them onto the square, making an L. Pointing to the "defect," he added an area of 25, thus completing the square, and added 25 to the 39 on the other side. Now, we have a square of side length $5 + x$, equal to a square of area 64. So, $x = 3$.

Jonathan Tennenbaum wrote a few pedagogicals on the impossible problem of cutting an angle into three equal parts, or trisecting it. He started by going the other way, first doubling an angle, and finding the mathematical formula that describes the transformation, sin 2a = 2sin a cos a (Figure 3). This was timed perfectly, for our little project to figure out what our teachers in high school "forgot" to tell us about trigonometric functions. We had figured out what sine, and cosine, and tangent, and their inversions, were, as projections of the circle.

Riana and I struggled to determine the trigonometric formula for tripling the angle, but kept running up against the wall of tough cubic functions. Later, when Jonathan walked us through the triple-angle formula, Riana exclaimed that, the wall we had been running up against was $\sqrt{-1}$! This was all fine, but I still didn't get the paper. I was frustrated that Gauss didn't just come out and say, in words, what his idea was. Why didn't

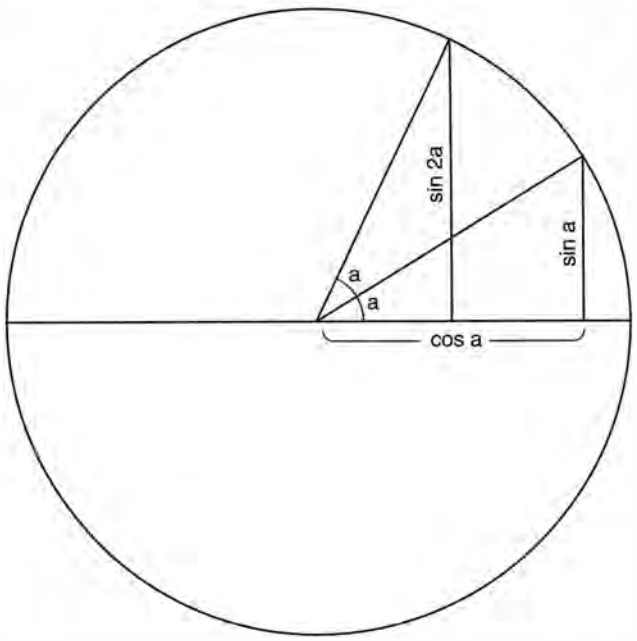


Figure 3
WHY IT IS IMPOSSIBLE TO TRISECT THE ANGLE
A step in showing why trisecting the angle is impossible was to determine the sine of two and three times the angle. Here, the problem of finding the sine of twice the angle is posed geometrically.

he just write out a list of points he was trying to make?

I decided to get the thing out again, and figure out what it means. What is this stupid equation?

$x^m + Ax^{m-1} + Bx^{m-2} + \ldots M = 0$

Bruce said that Gauss made two surfaces, that intersect each other and a flat plane. They all intersect, at the same time, in a number of places equal to the power of the equation, and those are the solutions. Cubic equations give three intersections, and so forth. Who cares if it works—where did he come up with this crazy idea?

One can solve linear equations with lengths, square equations with areas, and cubic equations with volumes. So, if your equation is $x^2 + Ax + B = 0$, we're talking about areas. But, wait, if you add x^3 to this equation, you are now adding a volume to several areas, which makes no sense. Perhaps, just by adding this new term, it suddenly shifts *all* of the quantities to volumes. x^2 is no longer a square, but a brick with volume $1 \cdot x \cdot x$. So, the highest power, could determine the geometry you are considering! The highest power controls the equation!

Science and the YOUTH MOVEMENT

But, what happens when you add x^4?

LaRouche had just written a paper called "The Historic Individual," where he talks of both Hamlet's fear of immortality, reflected in his Third Act soliloquy, and Gauss's concept of the Complex Domain, connecting them both with the principle of Leadership. Now, what does the Complex Domain have to do with a fear of immortality? What's immortality, for that matter? I reported my excitement to the other Seattle LaRouchies, to their similar excitement, and restarted the work on Gauss's paper.

Then, I promptly flew down to Los Angeles for several weeks.

Los Angeles

Anybody who visits the main West Coast LaRouche campaign office in LA, is immediately struck by the sheer quantity of pedagogical work being done. They had significantly fewer youth down there in November 2002 than they do now, but it still seemed like young people were pouring out of all nooks and corners of the building, all wanting to talk about Gauss. Or music, or Alexander Hamilton, or ancient Greek, or the American Revolution, or Nicholas of Cusa, or light propagation, or the history of our organization, or how to recruit, or any one of the last hundred papers written by our elected champion, LaRouche.

I was overwhelmed, right into a pedagogical session going until 2 in the morning, discussing the multiplication of complex numbers and logarithmic spirals, led by the now world famous Sky Shields. I found one activity lacking in the youth work down there—reading Gauss's actual paper. There was lots of pedagogy, and lots of discussion, and lots of activity, but very few people were actually taking on the feared manuscript.

However, I found that people were generally very excited to begin digging into it. So, we printed out several copies of the paper, and began working. Going through the first couple of sentences, I noticed the glazed-eye look, and immediately went into my little breakthrough about the powers. This sparked some thinking, and so we went further, into an actual Al-Khwarizmi solution. I used a different equation than Bruce had, and ended up with an irrational square root as a solution. We discussed the virtual non-existence of this number, and started to move on.

But, one of the organizers from Denmark stopped me, and asked why it matters, that the square root is an infinite decimal—you can get a good approximation from a calculator. In fact, by just going several decimal places, you can get to such a good approximation, that it would be almost indistinguishable from a more precisely calculated value. So, why all the fuss?

I explained that, you never get the number by calculation, only by building it. He replied, "No, you can get it from a computer. How exact do you want it? Ten billion digits?" It went on like this for a while, and I was getting more and more frustrated, and wanted to go on with the class, but couldn't just let this go.

Finally, after the class, dejectedly, I talked to Sky. He pointed out the problem of Euler and Lagrange, that they refused to address their fundamental assumptions. The task of the youth movement, is to make clear the process of finding the axioms, and smashing them, through the creation of a discovery. These classes are not intended to "go through" a procedure, but to break axioms. You use the material you are "going through" to provoke exactly the reaction of the Danish organizer—that's where the real pedagogy begins!

Looking back, I had achieved a rather superficial view of Gauss's paper. He was actually presenting a discovery, of what Lyn has described as, the rediscovery of the difference between a human being and any other form of life. Lyn wrote another paper around this time, "The Next Generations," which addressed this directly, and fighting with this work was the most productive period, up until then, in my continuing understanding of the significance of that 1799 paper.

My Brush Against The Complex Domain

I tried plowing through Lyn's paper several times, but always got stuck at a certain point. I always felt like I had run out of energy, and would either take a nap, or eat, or just find something else to do. Couldn't I control myself, and just finish the thing? I started to get quite frustrated, because I wanted to know how it ended! Finally, with Sky's help, I discovered the problem—I just didn't understand what Lyn was saying. In every paper I've ever read by LaRouche, he asks: What is the difference between man and beast? What is the difference between Euler and Gauss? Or between Aristotle and Plato?

The Aristoteleans (like Euler, Lagrange, and D'Alembert) believe that the extent of human knowledge, is describing what you observe with your senses, in terms of some virtually arbitrary set of assumptions. For example, if you assume that the most basic form of motion is in a straight line, and that changes are introduced through some mystical "forces," then you can explain the motions of the planets, as some "force" that is changing the "natural" straight-line motion of a body in space.

In fact, you can now shoehorn all of your observations into the framework defined by your geometric assumptions. Disregard the fact, that straight

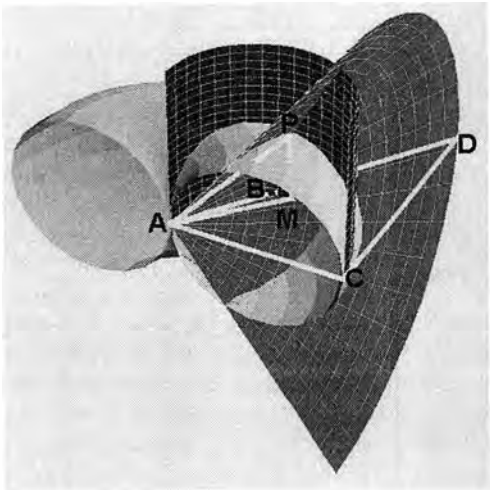


Figure 4
ARCHYTAS' CONSTRUCTION FOR DOUBLING THE VOLUME OF A CUBE
To double the volume of a given cube, one must find a length equal to what we call today the cube root of 2. Forget the calculator, can you construct it? Archytas, a contemporary and collaborator of Plato, was the first to show how. His solution requires the intersection of three surfaces. The solution is derived from the point P *in the illustration, where the torus, cylinder, and cone intersect. Gauss's construction in the 1799 "Fundamental Theorem of Algebra" paper also involves the intersection of three surfaces, and can be used to produce the doubled cube.*

lines are actually not simple to produce, and that we observe *none* in physics or astronomy. The Platonics, on the other hand, think their senses always give a poor, indirect view of something, which isn't necessarily reality, but which is caused by processes that are not sensuous.

Therefore, what you sense, is not what's really "out there," but is instead, a picture produced by your mind's interpretation of the organized phenomena, caused inside your sense organs, by something outside of your body. Already, since those sense-objects actually don't exist outside of you, one can see that, to impose a change on what you are sensing, it were better to attempt controlling those processes which *create* the sense-objects, than just manipulating the sense-objects themselves!

So, where does Gauss (or Hamlet) fall in this? In the refutations section of Gauss's paper, he shows that the proofs by Euler, LaGrange, and the others, don't work. In fact, he shows that the entire method they were using, could *never* produce a proof of the Fundamental Theorem of Algebra. They took their algebraic formalism, constructed a tautological web of algebraic manipulations, called this structure a proof, and had Napoleon invade any country that disagreed with them. The most glaring bit of evidence that these guys were frauds, was this thing that squeezed out of the cracks of their proofs, this $\sqrt{-1}$.

They acknowledged the eruption of this phenomenon, called it "imaginary," then proceeded to use it as a sense-object.

LaRouche shows what Gauss does here: He looks at $\sqrt{-1}$ *as a hole, created when observing, as an object, the relationship among sets of relationships. Euler and Lagrange took a true irony, put a bag over its head, called it "i,"* and then forgot about it. Gauss, instead, uses this irony as the window into the "beyond the senses" realm of reality.

What are the relationships, between real phenomena, presenting this irony, via our senses? Gauss calls this the Complex Domain; Archytas brushed up against this, also, thousands of years ago in Greece, in working on the problem of doubling the volume of a cube. Why did Gauss presume that he could "think" an idea, with his human mind, and that the idea would be equal to the process?

Gauss, in effect, was asking, "What must the universe be thinking, in order to produce such an event?" Well, first, it must be thinking an *idea.* I remembered back to that e-mail from Jonathan, where he said that, what tends to freak people out, is that these unsensed phenomena, are actually *human ideas.* In that sense, what is *real* about a human being, is not the body, but the ideas. If people continue to communicate them to future generations (unlike what most baby boomers have been doing), then there is no definite life-span for an idea, or, indeed, the human soul.

The problem with Hamlet, was that he thought he was only his body, and when confronted with evidence to the contrary, he freaked out.

After I got back to Seattle, I discussed this with Riana. We both agreed that Joan of Arc understood the principle of the Complex Domain, but from the standpoint of the immortality of the human soul. She knew that she was changing history, and could let her body be burned, knowing that she was actually created in the image of the Creator of the universe, whose ideas Gauss was trying to discover.

I was struck by the *presence* of the idea LaRouche was communicating, almost as if it were standing right behind me. We thus, again, renewed our work on Gauss, from a different standpoint: LaRouche's. But, we ran into a problem.

"I Hate Math!"

At the next International Caucus of Labor Committees (ICLC) national conference, in February 2003 in Virginia, my roommate Wesley got to ask LaRouche a question: "I understand the geometry of social relations, and I've been working on the Gauss. But, when making these geometric constructions, I say, 'So what?' Isn't the idea that, we must change the curvature of society? What does this have to do with social relations? By the way, I have no math background."

LaRouche answered with, when you discover a principle, how do you communicate it? How can you have a discovery communicated *to* you? Then, he said that, for students who have a horrible math background, the teacher must define a sufficient context, so that the student is led to ask the correct questions. From this standpoint, for the Gauss paper, Archytas is the first thing to work on, to get a sense of the geometric action, and why he was propelled to make his construction.

I took this as a challenge, and when we got back to Seattle, we began working on why Archytas' construction (Figure 4). Both Jonathan and Bruce had written pedagogicals on it, so we read through those. Then we read through them again, and again, and still did not

get why Archytas needed to do what he did.

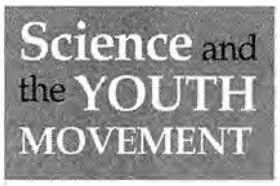
The crucial aspect of Archytas' model, is the construction of two means between two extremes. For example, from a bunch of cubes, you can construct 1, 8, 27, and so on. But, how do you get from 1 to 8? First, you make a row of 2 cubes. Then, you add two cubes to that, making a square of 4. Then you add four more cubes on top of that, finishing up the cube of 8—1, 2, 4, 8.

If 1 and 8 are your two extremes, then 2 and 4 are your two means. They are the "means" to get from 1 to 8. They work in ratios, too—1:2::2:4::4:8. If the edge lengths have the same relationships, 1:a::a:b::b:2, then finding the edge of the doubled cube is reduced to calculating the two means between 1 and 2. This is where most of the young eyeballs glazed over, in the weekly pedagogicals that we were doing.

I thought back to Lyn's answer to Wesley's question, and realized that people were asking "so what?" The context had not been sufficiently laid out, that a passionate drive to the discovery would be provoked. I decided to take one of my *reading days* (one day a week devoted to individual work), and get to the meat of Archytas, since I didn't really see why the construction worked, either. I worked for a few hours on Bruce and Jonathan's pedagogicals, drawing circles on my paper, wondering why the wild intersection of surfaces was necessary.

In organizing, one finds many people who can talk for hours, on opinions that they hold, regardless of whether their opinions are even true or not. For example, Leo Strauss could probably talk for hours on his opinion, that Plato actually thought justice was whatever helps out the more powerful person. People we meet in public, tend to believe that they can, also, talk for hours on why they think Leo Strauss was right. There is never any resolution, just talking.

What is required, is the performance of some type of *crucial experiment,* whose result would prove, beyond a doubt, whether the hypothesis was right or wrong. Really bad sophists are so scared of being proven wrong, that they will try to crush anyone who even poses the possibility of a crucial experiment for their hypothesis. In my work on this Archytas question, I reached a point where I hypothesized that, the only way to construct the two needed means, was by sweeping out a well-defined cone.



At this point, I was gripped by an almost religious drive to build some models, to see more clearly, what I was hypothesizing. I built the crude posterboard models, and saw that my hypothesis was, indeed, valid. Reflecting back on that passion, I could see how, if the process were aborted before acting on the hypothesis, I would have been left with a dull sense of blah—I wouldn't have a sense of discovery. This is what I believed LaRouche pointed at, as the problem that creates insanity, in his paper, *Rumsfeld As Strangelove II: Insanity As Geometry.*

I reported my discovery, that night, in the pedagogical session, by getting everybody else to build the constructions. But, they still didn't quite get it. They had not been driven to the same passion to do the experiment. Perhaps the context had not been laid out. For instance, what was the relationship to Gauss? Both Archytas' and Gauss's constructions involve the intersection of three surfaces, created by circular action. Gauss's construction can be used to, also, produce the doubled cube. We decided to put the Archytas down, after months of working on it, to return to Gauss's 1799 paper.

Did you miss the first articles in this series on "Science and the Youth Movement"? Back issues are available at $5 each ($8 foreign).

Punching Through

The biggest thing I've found to impede a person's work on Gauss's proof, or anything else, for that matter, is the fear that, there's no way you will ever understand it. On suggestion from Sky, I tried something interesting one night. I got everybody together, to listen to 10 seconds of the beginning of Beethoven's Op. 132 string quartet. I compared that to working a short distance into Gauss's paper, then stopping.

I then played the whole first movement, which, though nobody was clear on what the object of the piece was, gave a sense of a whole thought object, completed. We proceeded to read through Gauss's entire construction of his proof to the Fundamental Theorem of Algebra, that night. Though nobody actually got the proof, everybody followed the construction of it remarkably well, as it is actually not as un-understandable as it looks.

From there, we undertook some very serious work on the paper. A few of us began hammering away at Euler's proof again, we did a couple of sessions on different parts of the paper, with other people leading them, always bringing in new people with the intent of creating a human stir within them. We even started

building constructions of Gauss's surfaces for different powers.

History is now, through Lyndon LaRouche, demanding of my generation, the rediscovery of principles discovered by past human beings, and the transmission of these discoveries to the next generations. The science-driver quality of the work on Gauss, pushes the youth movement into mastering many different areas of human knowledge, like classical drama. In the same way a good actor, unlike the Arnold Schwarzenegger variety, conveys a thought object onto the stage of the audience's imagination, we must learn how to present the scientific discovery, like a drama, into the minds of our students.

Notes

1. Available from www.wlym.com/text/gauss_fundamental.doc

Letters

Continued from page 5

ated with significant forces (1 μm corresponds to 1 gf on the RC210 balance). Such a small displacement can easily be produced by a dilation, even if heating would be insufficient to lift the wire by convection. But when the wire exerts a tangential (horizontal) force on the balance plate by frictional force, the balance reading is changed, in the way I described.

I did not expect such an effect (shame on me?), but someone, having read the short communication, proposed to make the wire float. In such a case, the –1g weight change disappears, and only +2mgf seem to persist. But at this level, I would not say anything certain. The communication has not been useless, as it allowed me to find the origin of the observed weight readings.

Thank you for letting me know of the reward for antigravity—another time perhaps, who knows? All joking aside, I wanted to verify an allegation by Rémi Saumont ("Anti-Gravity, Myth or Reality," *21st Century,* Spring and Fall 2001) who seemed to me to be serious. But everybody can miss something. Gravitation is an interaction whose origin is not perfectly clear. (General Relativity does not make the point completely clear, even if it is an accepted and successful formalism. But the very nature of space-time curvature induced by matter-energy provides a physical point of interrogation—the mathematical nature of curvature being otherwise very clear).

I consider it to be of scientific relevance to examine serious claims related to gravitation—the main point being to examine things honestly.

Thank you for your reaction to the article. Only two people contacted me; you are the second. The first helped me to locate the origin of the observations.

Vincent Morin
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A Keplerian Solution To Life on Mars

To the Editor:

Perhaps the development and nurturing of living things is a Solar System phenomenon, not a planetary one? If so, the spectacle of a flotilla of unmanned spacecraft voyaging to Mars to ascertain whether living organisms exist there is a redundancy, because life has already been discovered in the Solar System, on our planet Earth.

This raises the question of whether life has a hitherto unknown multiplanetary geometry. If so, what is this overarching geometry? How is it possible for manifestations of life to develop simultaneously on different planets? What would be the material, non-action-at-a-distance connections between these varieties of life? Could spacecraft travelling to Mars detect these connections? How should the experiments on board be redesigned to do so?

To ask an Oparinesque question, could humanity come to be, so to speak, present at the creation of these connections, whatever they may be? To be sure, I am looking for a Keplerian solution here, and the grim Gaia hypothesis need not apply.

Each component of our Solar System, the single Sun, the rocky planets (Mercury, Venus, the Earth, Mars) our suspiciously large Moon (which makes the Earth a twin planet), meteor swarms and individual comets, asteroids, the gas giants (Jupiter, Saturn, Uranus, Neptune), the Kuiper objects to include Pluto, the Oort cloud, each planet's magnetosphere, their bow-shock waves, the interplanetary medium, the local bubble, and other so far unknown components have obvious and not so obvious functions in fostering and protecting life on Earth.

For example, Jupiter deflects cometary impacts. the Earth has a large Moon that stabilizes its axial tilt (providing for its seasons), and a magnetic field which shields it from harmful radiation. The Earth itself is large enough to hold a breathable atmosphere and orbits the Sun at just the right distance in a stable, nearly circular orbit (precluding temperature extremes) within the Solar System's narrow habitable zone, all situated between the Sagittarius and Orion arm of our galaxy, thousands of light years away from the dangerously active galactic core.

The question to be answered by the experiments carried aboard spacecraft voyaging to Mars is, again, not whether there is life there or not; rather, what is, was, or will be Mars good for in fostering life on Earth? At present (before terraforming) Mars is generally colder and drier than our coldest Antarctic winter, and being a much smaller object than the Earth, lacks the mass to support an atmosphere of life-giving oxygen, nitrogen, and water vapor. The atmospheric pressure on Mars is equivalent to the Earth's at 50,000 feet, exposing any organisms there to dangerous ultraviolet radiation.

Julian Grajewski
Hamburg, Germany
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Marsha Freeman Replies

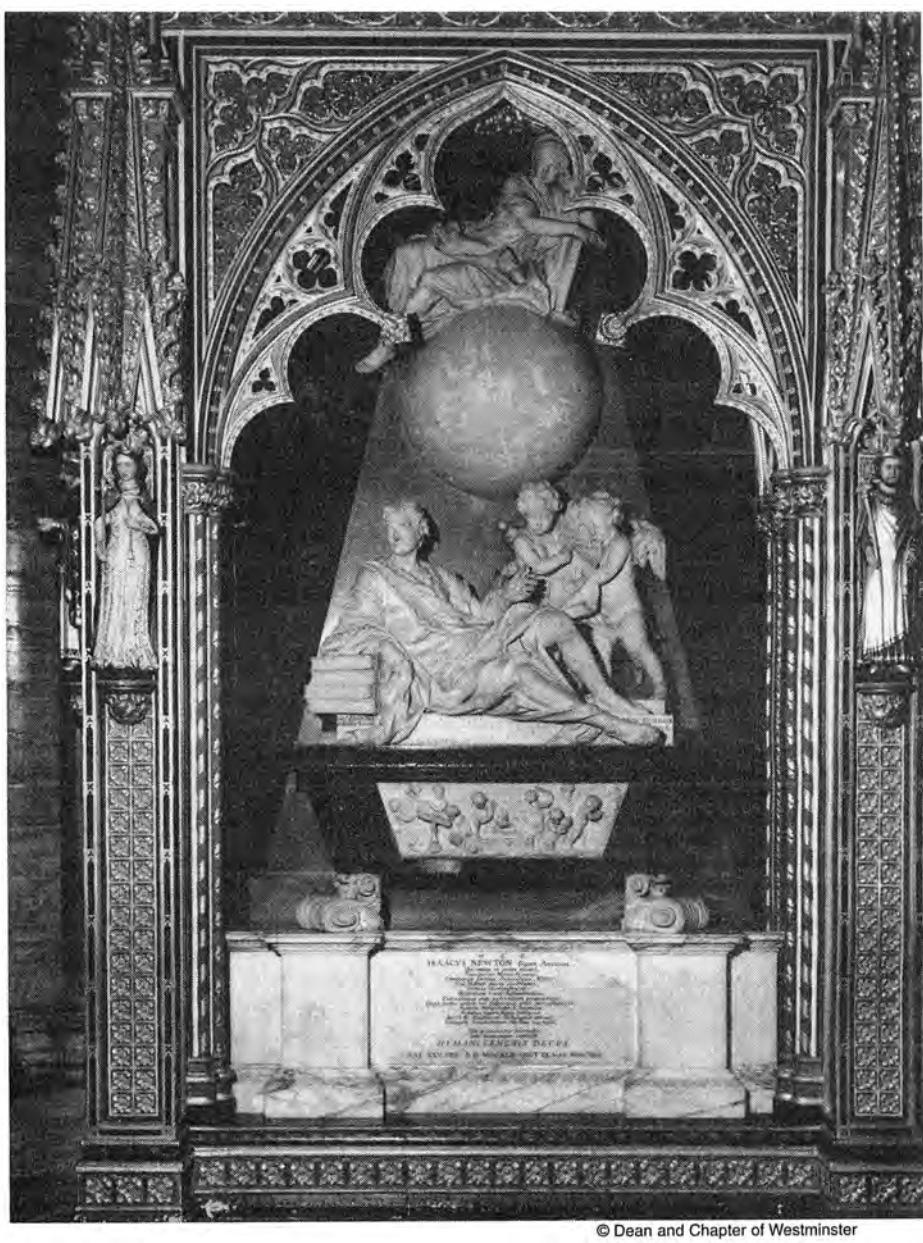
This is a very interesting thesis: to ask how the Solar System is organized to enable/protect the development of life. Planetary scientists pose the question the other way around; they say there is life on Earth, which has been enabled by features such as the existence of a Jupiter to sweep away deadly meteors, comets, and other potentially dangerous bodies. The writer asks: how did life, an organizing principle from the beginning of the development of the Solar System, alter/determine the Solar System's formation? A very challenging idea.

The Pagan Worship Of Isaac Newton

by Lyndon H. LaRouche, Jr.

October 20, 2003

The widespread assumption that scientific truth is established by reference to a perfectly consistent, closed inductive-deductive system, is a form of clinical schizophrenia leading to menticide.



© Dean and Chapter of Westminster

This elaborate memorial to Isaac Newton stands in Westminster Abbey, in front of the choir screen. Above his sarcophagus is Newton's reclining figure, leaning on his books. Behind him is a pyramid topped by a celestial globe and the figure of Astronomy. The inscription reads, in part, "Mortals rejoice that there has existed such and so great an ornament of the human race."

Preface: The Curse of Modern Empiricism

The most common source of the great, truly tragic failures of official society's attempted practice of physical science, are found in the chasm which separates science pursued merely as a professional occupation, from science pursued as a mission for discovery of truth. In the first case, the professional asks, "Will it be accepted? Will it work?" In the second case, he asks, "Have I proven that this is actually true?"

Forget the customary academic double-talk! Forget what your peers say! "Is it really true? Do you really know it to be true, or do you merely expect that your peers will share your wish to believe that it is true? Do you believe it, only because you fear ridicule if you do not?"

"Should you actually believe in what you propose?" For the so-called "practical mind," the usual philistine of business, politics, or science, the difference between the two may be thought to be slight, even of merely trivial significance. On the contrary, between the two states of mind there is a gulf, a deep gulf, and one which is almost unbridgeable, a gulf which represents what is often a tragic difference, not only for the scientist, but for the culture itself.

In today's politics, for example, I am confronted currently by nine pathetic rivals for the Democratic Party's 2004 U.S. Presidential nomination. Some of these are intelligent and capable legislators, but as Presidential candidates they have been, so far, a pitiable pack of pure disaster. Among those few of that pack worth mentioning, the problem is not that they lack the intelligence-potential for a reasonable understanding of the issues of war, economics, and social justice which menace our republic today. The problem is, that in their roles as candidates, they lack the simple "guts" even to address these issues publicly, just as they have each and all shown the lack of "guts" to debate relevant matters such as the current, systemic economic crisis publicly with me, a nationally leading candidate for the nomination, and, on the public record, the world's leading long-range economic forecaster of the past several decades to date. The general type of psychopathology responsible for this emotional failure by those otherwise capable persons, is of crucial significance for understanding those specific matters of economic science on which our attention will become focussed in the body of this report.

Courtesy of AIP Emilio Segrè Visual Archives

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Isaac Newton (1642-1727), right, was transformed from a black-magic dabbler into a demigod, as part of the financier-oligarchical battle against the Platonic and Renaissance idea that differentiates man from beast. Leonhard Euler (1707-1783), above, continued the cult of Newtonian empiricism in physical science.

For this occasion, I shall now precede the presentation of my proposed solution for that problem with a description of the principal source of relevant expressions of the presently continuing scientific incompetence often met among leading university-trained economic professionals and others today. Hence, the immediately following prefatory summary of the modern political history of this problem of physical scientific practice. After that summary, I shall turn, in the body of this report, to the meat of that problem as reflected in the crisis of the presently onrushing breakdown of the world's present monetary-financial system.

For that purpose, I devote this preface to the exemplary, tragic case of a very famous, professed devotee of Isaac Newton, Leonhard Euler.

Given Euler's extensive accomplishments in mathematics as such, his sundry attacks on Gottfried Leibniz's uniquely original discovery of the infinitesimal calculus, were not merely wrong, but a fraud, a dirty lie. For more than two centuries, Euler's sundry—each vicious—hoaxes against Leibniz, have been copied, more or less directly, by a majority among our culture's relevant textbooks and classrooms. Today, those false premises which Euler had employed have become an implicitly self-evident dogma, even for many professionals. The notable, if radically extreme examples of that dogma, include the influence of such acolytes of the pathetic Ernst Mach and thoroughly evil Bertrand Russell as Norbert Wiener (the "information theory" hoax), John von Neumann (the "systems analysis" and "artificial intelligence" hoaxes), and also the latter's dupes, still today.

All dirty lies!

As I shall show, these hoaxes by Euler and his empiricist fol-

lowers may not have caused all of the leading systemic incompetencies of today's university and related professional training in the subjects of economic policies; nonetheless, they did cause much of it, and they typify the erroneous method which has been the principal cause of the rest.

Euler's fraud was premised on the version of empiricism associated with such followers of that influential Paris-based Venetian, Antonio Conti, who played a guiding hand, from Paris, in transforming what had been a relatively obscure dabbler in black magic, Isaac Newton, into a Voltaire-backed celebrity of the Eighteenth-Century British-French "Enlightenment." Although the system of moral corruption known as empiricism had been introduced to Seventeenth-Century England and France by the influence of Venice's Paolo Sarpi on such Anglo-Dutch and French figures as Sir Francis Bacon, Thomas Hobbes, René Descartes, and John Locke, it was the 1688-1689 capture of the British Isles, as led by the Netherlands India Company's William of Orange, and the related political and military developments of 1689-1714, which gave new twists to Sarpi's neo-Ockhamite doctrine. It is only from this point of historical reference, that we are able to situate the present-day political significance of reductionists such as Euler, Lagrange, Kant, Laplace, Cauchy, et al. for reference.

The clinical characteristic common to most of the foregoing, or similar cases of behavior from among academics and the like today, is that person's hysterical blindness to what should have been obvious to him as folly in choice of method. Such behavior from among professionals, or the like, can not be fairly classed as anything but psychopathological "hysteria." The irrelevant kind of emotional outbursts which often color the polemics of such persons, must be recognized as just that. Their outbursts often reflect passions which were better attributable to neuroses, or worse, than issues of substance. In the matter of their worship of their demigods, such as Newton, Euler, Lagrange, Laplace, and Cauchy, many devotees even among professionals, are, as I shall show here, no better than religious fanatics.

This pathology among professionals is usually expressed as follows.

The referenced frauds by Euler et al., typify cases in which formal, deductive-inductive consistency is employed as such a kind of sleight of hand. The crucial point to be made in diagnosing those tricks, is that that person's deductions are controlled by the reductionist's use of essentially fictive (e.g., *a priori*) forms of "self-evident" definitions, axioms, and postulates. Such are the fictions of Euclidean geometry, of the empiricist's William of Ockham, or Descartes. As in the case of the widespread corporate folly of substituting what is called "benchmarking" for actual engineering design, these fictions have been used by them as a relatively cheap replacement for that experimental proof of principle which is required to define any rational form of elementary proposition of mathematical physics. Scholars of modern literature should recognize that kind of behavior among mathematicians as something from English academic life of early Eighteenth-Century Britain, which Jonathan Swift described in his allegorical account of the Voyage of Lemuel Gulliver to Laputa.

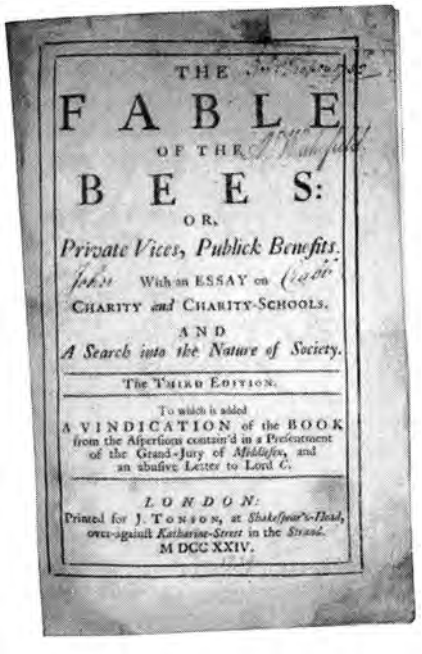
In the longer history of European mathematics, the form of the issue posed by hoaxes such as Euler's, is traced back to ancient sources such as the Sophists, or, to the same effect, the method of rhetoric employed, against Plato's work, by Demosthenes' pupil Aristotle. All the most famous modern hoaxes of European professional mathematical physics, are derived from the sophistry of Aristotle, either directly, or as Paolo Sarpi's founding of the more radical sophistry of modern empiricism echoed the medieval irrationalist William of Ockham.

'Power' Versus 'Energy'

Take the Classical conflict between the concepts of "power" and "energy" as a most appropriate illustration of that point.

The crucial issue of contemporary mathematical physics posed by that Plato-Aristotle conflict, that summarily detailed by my associates Mr. Antony Papert and Dr. Jonathan Tennenbaum, is a pivotal point of the deadly controversy, on the subject of geometry. Where Plato writes what modern usage translates as "power" (*dynamis*), or the *Kraft* of Leibniz's German, Aristotle writes "energy." The two terms, "power" or "energy," so employed, signify directly opposite meanings, and refer to directly opposite kinds of objects: Power represents the role of universal physical principles in being the cause of a specific quality of action; Aristotle's notion of energy, as brought into modern practice by such empiricist opponents of Carl Gauss, Wilhelm Weber, and Bernhard Riemann as Clausius, Kelvin, Grassmann, Helmholtz, Maxwell, Boltzmann, and the pack of radically reductionist, positivistic fanatics associated with the cult of Ernst Mach, et al., represents an effect.

"Power," as Plato emphasizes, is typified by what the Pythagorean Archytas demonstrated as the solution for doubling the cube by nothing but geometric construction. "Power" signifies the practical effect (e.g., physical effect) of employing the discovery of *an experimentally defined universal principle* to effect a *qualitatively superior* outcome of some


THE
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OR,
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With an ESSAY on
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In The Fable of the Bees, or Private Vices, Publick Benefits, *Bernard de Mandeville (1670-1733) wrote that "Vice is beneficial found" and "Bare Vertue can't make Nations live in splendour."*

Carlos de Hoyos

Children at the Schiller Institute summer camp, guided by Pierre Beaudry, constructing Platonic and Archimedian solids, using the pre-Euclidean, constructive geometry of spherics. Below, a contemporary model of Kepler's nested Platonic solids, which represent the relationship of the planets and their orbits.

Stuart Lewis

human action upon our universe. Aristotle's "energy," as adopted by the Nineteenth-Century authors of a reductionist mathematical thermodynamics, is an irrational "demon," such as that Maxwell demon who exists only under the floorboards of bad dreams. Modern sophists insist, as sophists would be expected to do, that these empiricists were speaking as scientists; the truth of the matter is, that these were sophists substituting a nasty sort of religious belief for science. The religion in question is properly identified as "demon"-worship.

For example, Bernard Mandeville's *The Fable of the Bees* argues that the unleashing the willful "demon" of individual wickedness ("vices") of individuals makes society prosperously happy. Physiocrat François Quesnay's notion of *laissez-faire,* and Adam Smith's plagiarism of Quesnay's *laissez-faire* as "free trade," proffer exactly the same worship of the irrational "demon" vice as does Mandeville's *The Fable of the Bees.*[1] To the same effect, radical positivist Norbert Wiener invoked the powers of "Maxwell's demon" to found his "information theory" hoax.

"Power," as defined by the arguments of Plato and Leibniz, is typified by the principled discoveries of physical chemistry, through which we have progressed from use of simple solar radiation, through the higher, Promethean power represented by controlled use of fire, through the successively higher powers represented by rotating machinery, and through use of nuclear and thermonuclear reactions. Each of these steps takes society upward in respect to man's power over his circumstances, per capita and per square kilometer. This progress is accomplished through those discoveries of principle by means of which we deploy the same effort to achieve a qualitatively more effective result. Plato's concept of power, is the principle underlying the successful performance of the practice of technology in bringing about the very existence-in-fact of all successful phases of modern European political-economy.

This notion of power may be traced for today directly from the Pythagoreans' use of a pre-Euclidean method of constructive geometry, a method derived from that ancient progress in astronomy which they named "spherics." It was from viewing the visible heavens as a display of motion within a spheroidal space of very, very large diameter, both as astronomy, and as the related matter of principles of transoceanic navigation, that a Classical Greek culture of such as Thales, Solon, and Pythagoras, one informed by the magnificent Egyptian knowledge to be read from the design of the Great Pyramids, introduced the concept of "efficiently universal principles" to European civilization. That crucial point should be restated for clarity, as follows.

The Pythagorean school of pre-Euclidean, Classical geometry, adopted the crucial paradoxes of a constructive geometry as typifying the effect of the action of universal physical principles. Thus, they associated the notion of universality with the behavior of the spheroid universe perceived around us, and defined universal physical principles as those unseen causes which generate the lawfully recurring anomalies of the observed "spheroidal" domain. So, for Kepler, the paradoxical apparent back-looping of the Mars orbit, reflected the role of universal gravitation in the organization of the relations among the planets of our Solar system.

Thus, they asked such elementary questions as: (1) Define the meaning of a line. Now, attempt to construct the doubling

1. Adam Smith, *The Theory of the Moral Sentiments* (1759). This was published three years prior to Lord Shelburne's assignment of Smith to the project which included Smith's plagiarizing of the Physiocrats Quesnay and Turgot. This 1759 work reflects chiefly the influence of the same David Hume who was chiefly responsible for the mind-set of his German representative Immanuel Kant. The coincidences in method of the 1759 Smith and his later plagiarisms of the work of Quesnay and Turgot, as also Locke, and Mandeville, are reflections of a consistency, respecting the attributed nature of man, which pervaded the Eighteenth-Century "Enlightenment."

of a length of such line within the bounds of "lineness" so defined. Ah! We must proceed to an added, higher principle, the notion of a surface: lines as determined by surfaces. (2) Double a square by construction, not arithmetic. The paradox of irrationals now supersedes simple linearity. A mean principle, between the original square and its double must be defined. (3) Now, to double a cube by construction; the so-called Delian Paradox requires a successive pair of mean actions. The actions by which we may proceed from an apparent line, to a surface, and from a surface to a solid, are required to deal with the universe as presented to us in an intrinsically paradoxical form by sense-perception. Thus, these principles of constructive geometry's domain of astronomy-cued spherics, are efficiently *universal physical principles,* principles which are expressed as phenomena of constructive geometry, examples which show us the physical-experimental basis on which the existence of a competent (for example, Gauss-Riemann) mathematics depends.

A special, fourth case, beyond the line, surface, and solid—that of the uniqueness of the constructibility of a series of Platonic solids—shows us, as both Plato and Kepler famously illustrated this point, that the physical universe is not a self-evident sort of empty space invaded by particles—not the space of "action-at-a-distance." The universe, including what sense-perception attributes to space, is governed entirely (as Leibniz showed, pervasively and *perfectly-infinitesimally* throughout), by universal physical principles; the very existence of space (and, also, time) depends upon principles which must be discovered in an experimental-physical way, never *a priori.*

To recapitulate, and re-enforce this crucial point just made, reflect upon the following cases.

Kepler's uniquely original discovery of universal gravitation; Fermat's principle of quickest (rather than shortest) pathway; Leibniz's definition of an infinitesimal calculus; Leibniz's discovery of the interrelated notions of the catenary, of a physical principle of universal least action, and of the associated notion of natural logarithms; make a distinction between sense-perception and the universal principles which are not directly sensed, but whose existence is proven to be the efficient authorship of the relevant paradoxes of sense-perception.

***"[T]he physical universe is not a self-evident sort of empty space invaded by particles. . . . [T]he very existence of space (and, also, time) depends upon principles which must be discovered in an experimental-physical way, never* a priori."**

The problem of representing the relationship between sense-perception and a provable physical principle, as was presented by Kepler's discovery of gravitation, was solved, successively, by the work of defining the complex domain, by, chiefly, Carl Gauss and Bernhard Riemann. This latter method preserves the Pythagorean notion of spherics, and, in the case of the catenary-related notion of universal physical least-action, employs the principle adopted by Archytas to solve the doubling of the cube by construction. That latter model, as referenced by Gauss's 1799 paper on *The Fundamental Theorem of Algebra,*[2] has served as the guide to developing an appropriate form of mathematical representation of the relationship between sense-perception and the unseen, but efficient principle.

Those principles, so conceived, represent *powers* in the Platonic sense.

Unfortunately, under the Romans, civilization took a giant step backward from the science and culture of Classical and Hellenistic Greece. The hoaxster Claudius Ptolemy's Aristotelean system of astronomy, which continued to dominate European civilization until the discoveries of Kepler overthrew the astronomy of Ptolemy, Copernicus, Brahe, and of Sarpi's Galileo, is typical of long-ranging frauds, such as the empiricism which has gripped Euler and his followers to the present day.

Those distinctions between the scientific principle of "power," and the reductionist "demon" (or, "vice") called "energy," are implicit in the original discoveries of Kepler and Leibniz, but began to be made clearer through the influence of the great Eighteenth-Century educators Abraham Kästner and Hofrath A.W. von Zimmermann on their student Carl Gauss. Kästner's argument prescribed a return to anti-Euclidean (and, also ante-Euclidean) constructive geometry. This was reflected simply and clearly in Gauss's 1799 *The Fundamental Theorem of Algebra,* and in the subsequent development of the general principles of curvature leading into that celebrated 1854 habilitation dissertation by Bernhard Riemann which defined a comprehensive notion of a universal physical geometry, and defined, for me (during 1952-1953), the needed notion of a practicable form of that *science of physical economy* which is reflected in this paper.

Indeed, through the span of the history of specifically European civilization, since the work of Thales, Solon, and the Pythagoreans, there has been a see-saw battle between the forces of Classical humanist science, as typified by Plato, and the opposing forces of reductionism, as the latter is typified by the Delphi cult of the Pythian Apollo, the Sophists, and those celebrated "featherless bipeds" known as the Aristoteleans. The judicial murder of Socrates by that Democratic party of Athens otherwise known as the Sophists, typifies the essence of the fundamental division in all European civilization, from before the Age of Pericles to the present day. *Modern reductionism, as expressed by the referenced work of Euler and Lagrange, is essentially a symptom of the continuing controversy, a controversy which the judicial murderers of Socrates defined as an issue of religion, the issue of that form of pagan religious fanaticism expressed by Euler's fraud against Leibniz.*

The origin of the form of neo-Aristotelean and empiricist doctrines specific to Europe's Sixteenth Century, was the effort, by the reactionary forces left over from medieval society, to eradicate the leading influence of Europe's Fifteenth-Century,

2. Carl F. Gauss, *Demonstratio Nova Theorematis Omnem Functionem Algebraicam Rationalem Integram Unius Variabilis, Werke III,* pp. 1-31. Various translations.

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Out of the cultural revolution of the 15th Century Renaissance came Louis XI in France, left (reigned 1461-1483), and Henry VII in England (reigned 1457-1509), national leaders who began to assume responsibility for the improvement of the general welfare of its people, overturning feudalism. It was this emergence of the nation state that the Enlightenment sought to bury.

Italy-centered Renaissance. The account of the Euler controversy must be situated clinically in that context.

The Origins of Euler's Empiricism

Consider the political history of that hoax by Euler et al.

This Fifteenth-Century Renaissance had produced the first modern nation-states which were premised upon the principle of national sovereignty of those kinds of governments committed to the defense and promotion of the general welfare of all the population and its posterity. These principles were not new in themselves; the Classical Greece of Solon, Socrates, and Plato had already defined those principles. The Christianity of the Apostles John and Paul had put the Platonic principle of *agapē* (*"the common good"*) at the center of the practice of Christianity. However, it was almost two millennia later than the lifetime of Plato, that Louis XI's France and Henry VII's England appeared as the first two such states actually based on the common good (*the general welfare*) to exist in known history of the world.

The existence of modern political-economy dates from precisely those reforms institutionalized by the Fifteenth-Century Renaissance, and brought to a concrete form of realization under Louis XI and Henry VII. The modern state begins when that state ceases to tolerate the degradation of large sections of the population to the status of human cattle, such as slaves or serfs. It is the perfectly sovereign state's assumption of inalienable responsibility for the general welfare of all the living population and its posterity, which creates the indispensable natural-law basis for sovereign nation-states and for all doctrine of political-economy. Unless the government assumes its accountability for the maintenance and improvement of the general welfare of all its people and their posterity, that government is not acting as a legitimate nation-state under moral, e.g., natural law.

That poisonous weed, the form of society which that Renaissance sought to destroy, was, immediately, the medieval rule of most of Europe and its vicinity by the combined forces of the imperial maritime power of Venice's financier oligarchy and the Norman chivalry. It was the latter, unrepentant medievalist forces, led by Venice, which struck back with their effort to crush the Renaissance; that, by such means as the religious warfare spawned repeatedly over the course of the 1511-1648 interval.

This Venetian reaction was typified in significant part by the roles of Cardinal Pole, Thomas Cromwell, and royal marriage-counselor Zorzi (a.k.a. "Giorgi"), in Venice's recruitment of England's King Henry VIII. The new Aristoteleanism of Sixteenth-Century Venice, complemented by the introduction of empiricism by Venice's Paolo Sarpi and his household lackey Galileo Galilei, coupled religious and related forms of warfare with the political role of the Habsburg dynasties, not only for the purpose of restoring those medieval practices which had degraded most persons to the condition of virtually inhuman cattle; they sought to accomplish this with aid of a systemic effort to uproot those Fifteenth-Century conceptions of natural law which set all persons absolutely apart from and above the beasts. The crucial fact to be emphasized through this report, is that *empiricism, the cult which produced such included, characteristic phenomena as the figures of Isaac Newton and Leonhard Euler, was crafted by Sarpi and his followers to the specific purpose of uprooting that conception of the individual human mind (and, therefore, soul) upon which all scientifically valid distinction of man from human cattle depends.*

For those reasons, as I shall show here, the introduction of empiricism to supplant the Judeo-Christian-Muslim conception of man—man as made in the likeness of the Creator—defined empiricism as implicitly a pro-Satanic form of religious practice. The term "Satanic," so employed, identifies the generic quality of each and every systemic effort, such as that of the empiricist, to bestialize man as, for example, Thomas Huxley, Frederick Engels. Friedrich Nietzsche, Bertrand Russell, and the so-called "Frankfurt School" have done. The history of the modern development of empiricism, since Sarpi, is summarized as follows.

This continuing struggle by the Venetian tradition, to uproot the institutions of the Fifteenth-Century Renaissance, assumed a slightly altered political form with the late Seventeenth-Century decline of Venice as a state with former claims to imperial maritime power. The period of the wars of France's Louis XIV, the coup d'état of William of Orange, and the 1714 seating of George I on the newly established British throne, shifted the location of the imperial political power formerly deployed by Venice, to those virtual clones of Venice's financier oligarchy which appeared in the form of an emerging Anglo-Dutch Liberalism, a form which became known during the course of the Eighteenth-Century as "The Venetian Party." Out of this process of change, a modified organization of the empiricist cause emerged under the name of "The Eighteenth-

University of Koeln

Lithograph by Adolf Kunike

The Granger Collection

Leaders of the 18th Century Classical humanist movement in Germany, in the tradition of Leibniz (from left) Moses Mendelssohn (1729-1786), Gotthold Lessing (1729-1781), and Abraham Kästner (1719-800).

"This Classical movement, which spread its influence against empiricism throughout much of Europe, formed the intellectual basis for spiritual and physical support of the cause of American independence. . . ."

Century French and British Enlightenment."

Beginning 1689, but especially with the subsequent accession of George I to the British throne, the emerging Eighteenth-Century Enlightenment came increasingly into conflict with a growing impulse of old Europe of that time, a growing impulse toward establishing a true modern republic among the English colonies of North America. With the 1763 British peace treaty with France, Lord Shelburne's British East India Company and its puppet-king, George III, moved to crush, "preventively," the emerging American tendency toward independence. Opposite to the rabid empiricists of the British East India Company's "Venetian Party," was the new Classical humanist movement which emerged around such figures of Germany as Abraham Kästner, Gotthold Lessing, and Moses Mendelssohn. This Classical movement, which spread its influence against empiricism throughout much of Europe, formed the intellectual basis for spiritual and physical support of the cause of American independence, up to the point of July 1789 and the subsequent Jacobin Terror.

For related reasons, the center of the conflict between Classical humanism and empiricism ("The Enlightenment") in Europe was centered in Frederick the Great's Berlin, where the empiricist forces represented by Voltaire, de Maupertuis, Euler, Lambert, Lagrange, et al., were in pitched intellectual battle with the opposing forces grouped around the Leibniz tradition of Kästner, Lessing, Mendelssohn, and their followers. It was the deaths of Mendelssohn and Lessing which cleared the way for the appearance of an Immanuel Kant who would have been demolished politically had he published his infamous collection of sophistries, called *Critiques,* while Lessing and Mendelssohn were active as the intellectual lions of Berlin, Leipzig, et al. It was the French Revolution and its Napoleonic aftermath which restored the Romanticism of the Eighteenth-Century Enlightenment to a vengeful hegemony over most of the political life and culture of Europe, and thus prepared the way for the two great wars of the Twentieth Century.

Euler had been a leading part of the anti-Leibniz cabal during the period of influence of Lessing and Mendelssohn. It was the writings of Lagrange and Immanuel Kant during the middle through late 1780s and 1790s, which embedded the broader philosophical implications of Euler's empiricist corruption more widely within what was to become Napoleonic Europe's insurgency of the Nineteenth-Century German Romanticism of Kant, G.W.F. Hegel, et al.

The precepts of that Newton cult are usually presented, as by Euler, solely as a matter of the indoctrination of professionals in a form of blind utopianism, a form of utopianism which is, without exaggeration, a pathetic form of religious belief. Or, to restate that point, the faith expressed by such clinical cases expresses the kind of sharing of belief we should associate with phenomena of mass-psychosis, such as a mass delusion. The notable proponents of this cult of empiricism do not actually know what they say; but, rather, rely upon their mere wish to believe certain arbitrary, axiomatic assumptions constructed as a matter of blind faith. That wish thus assumes the functional role of a unproven, "self-evident" axiom.

The specific form of this religious faith which I am addressing here, the cult belief which Euler shared, is to be recognized as the Anglo-Dutch empiricism associated with the Anglo-French Eighteenth-Century "Enlightenment's" notorious scalawag Voltaire. The personal relationship between Leibniz-haters Euler and Voltaire in Berlin, is typical of the connections among the "Enlightenment" faction of that Century.

Leibniz and Gauss Versus Empiricism

This Eighteenth-Century hoax spread by the circles of Conti, Voltaire, Euler, the French Encyclopedists, Euler, et al., is the same fraud exposed as such by Carl Gauss's statement of the case for the complex domain, in his 1799 *The Fundamental Theorem of Algebra.*

The most immediate proof that Euler's argument is willful fraud, is that that admittedly expert mathematician, and Leibniz-hating fanatic, Euler, was fully knowledgeable respecting those characteristics of the generalized conic functions which demonstrate that the rate of change of curvature of an

elliptical function is intrinsically, and ontologically, an infinitesimal function, as Kepler, Pascal, Leibniz, and Jean Bernouilli had successively defined this. Euler was also informed of the work of Leibniz and Jean Bernouilli, including the principle of physical least action, the notion of the infinitesimal calculus, and that notion of natural logarithms which Euler parodied from Leibniz's original work. This was the kernel of the fact exposed by Gauss in 1799.

The principal experimental proofs, which were fraudulently evaded by Euler, were two. I now include some restatements of some of the points made above, in this specific context.

The first such proof, was Johannes Kepler's warning of the need to develop an intrinsically infinitesimal calculus, for astronomy, as this need was demonstrated experimentally, for the case of the planetary orbits, by Kepler's 1609 *The New Astronomy.* Leibniz's work in Paris, including the relevant study of the work of Fermat and Pascal, and Leibniz's collaboration with Christiaan Huygens, produced Leibniz's original discovery of such a calculus, from about the time of his 1676 submission of that discovery to a Paris printer. The second, more comprehensive such proof, was the outcome of continuing work on this through the beginning of the next century, work which led Leibniz, working in collaboration with Jean Bernouilli, to the elaborated development of *the physical principle of universal least action.* This latter was a more adequate version of his earlier development of a calculus, as developed through a deeper examination of the evidence of *physical pathways of quickest action* (rather than the naive notion of shortest Euclidean pathway).

Leibniz had addressed this latter point in a richer elaboration of his uniquely original, earlier discovery of the infinitesimal calculus, in demonstrating the universal principle of physical least action, a demonstration which Euler referenced in his own, fraudulent attack, from Berlin, on this work by Leibniz. This added work by Leibniz, clarified the universal physical significance of the catenary, and defined the notion of natural logarithms before Euler's effort to redefine such logarithms from a reductionist standpoint. This work by Leibniz was to serve as a starting-point for Carl Gauss's definition, from 1799 on, of the complex domain and related general principles of mathematical-physical curvature.

Study of the practical implications of seeing the path from Gauss's development of the general principles of curvature, to Riemann's 1854 habilitation dissertation, illustrates the crucial importance of these issues for the teaching and practice of science today.

Euler's hateful attacks on Leibniz's work were therefore a product of asserting an argument which Euler knew to be false. In this way, he laid the basis for Immanuel Kant's reliance, in the latter's *Critiques,* on the argument by Euler and Lagrange, in Kant's own defense of axiomatic irrationalism. *As I have already announced that intention above, I shall explain here, that the subject of Euler's hoaxes is not merely a problem internal to the formalities of classroom mathematical physics; it is nothing but a religious issue, the issue of the nature of the assumptions of belief, respecting the nature of man in the universe.* Mathematicians shall not hide behind their blackboards, nor digital computers; the issue is not one peculiar to the department of mathematics, but to the domain of religious belief from which empiricism has drawn the policies which it has imposed, as axiomatic, upon empiricist practice of mathematics. It is, therefore, only in its relationship to religious belief that empiricism could be competently judged.

Sylvia Dorn, Leipzig University

Leibniz's ground-breaking philosophical work, including his elaboration of the principle of physical least action, formed the basis for the later discoveries of Carl Gauss and Bernhard Riemann. Euler and the 18th Century Enlightenment circles maliciously derided and buried Leibniz's work and his world outlook. Here, a statue of Leibniz at Leipzig University.

The appropriate treatment of such an issue does not belong in the department of arithmetic, but in the department of philosophy. By philosophy, I point to the subject of epistemology, in which attention is focussed upon the choice of the kind of slippery assumptions which modern sophist Euler, for example, superimposed arbitrarily upon the form of argument he

". . . I shall explain here, that the subject of Euler's hoaxes is not merely a problem internal to the formalities of classroom mathematical physics; it is nothing but a religious issue, the issue of the nature of the assumptions of belief, respecting the nature of man in the universe."

employed against Leibniz. From the standpoint of epistemology, Euler's argument for his savage defamation of the modern Socrates, Leibniz, was essentially a parody of the methods of the ancient Sophists.

The religious side of this matter is one which needs to be made clear, with all delay removed: U.S. Speaker of the House of Representatives Tom DeLay, for example.

All that argument which I have summarized here so far, is true in its own right, as a mathematical-physics proposition as such. However, merely stating the formal proof of a fact is not sufficient. The proven facts I have cited so far, do not explain the essential practical implication of Euler's hoax for the political situation in Europe and the U.S.A. still today. We must show how and why this fraudulent defense of Isaac Newton, on an issue of mathematics, became a central feature of the Eighteenth-Century, and presently continuing attack on the political movement which led into the U.S. 1776 Declaration of Independence.

Leibniz Und Europe, Hannover: Schlütersche, 1993

Leibniz in Berlin, 1700. This 1855 woodcut, based on an 18th Century illustration, depicts Leibniz (hand on globe) tutoring the serious Princess Sophie Charlotte in statecraft, while her not-so-serious courtiers look on.

The political motive is the same motive behind the British monarchy's repeated 1763-1865 efforts to crush the U.S. republic in its cradle. An understanding of that same specific type of motive behind the Newton hoax, is of crucial importance for understanding the hoax itself. The key to understanding that motive is found, by treating philosophical empiricism for what it is, a form of pagan religious cult traced from sources such as the Phrygian cult of Dionysus, the Delphi cult of Apollo, and the Sophists' judicial murder of the ever-Sublime Socrates, in Athens at the close of the Fifth Century B.C.

Thus, as I shall show here, the importance of exposing the Newton myth as a hoax, in this way, is that: Only those with the personal integrity, and courage, to attack a religious problem of sophistry, such as the matter of empiricism, are capable of leading mankind to freedom, away from a repetition of the worst horrors which globally extended modern European civilization has experienced to date.

So far, what I have said in these prefatory remarks, either has been said, or might be said, by my collaborators (among other qualified reporters). I give that entire matter a different frame of reference, *the role of emotion in the practice of scientific discovery and belief.* I bring thus to physical science, the crucial importance of a moral issue, the issue of *the difference between merely doing one's duty in the sense of performing an assigned task, and the seeking of and fulfilling a duty which is selected as a necessary service of a life's mission of immortal importance in itself.*

In other words, we must distinguish between science, for example, practiced as a means to an end, and the practice of science as an end in itself. Science as a means to an end, poses the question, "Will it work?" Science as an end in itself, poses the question, "But, is it also true?" All the sad or even ugly failures of what might appear to be technically competent science, fall into the gulf lying between those two distinctly different ways of practicing science.

One way, perhaps the best way of illustrating that point to a relevant contemporary audience is, as I have already stated here, to lay the emphasis on the fact that the frauds of such as Leonhard Euler must be attributed to a nasty variety of explicitly religious belief.

1.
Empiricism As a Religion

I shall now show that the adopted empiricism of Euler and his co-thinkers is a religion.

In the preceding introduction, I have indicated summarily that the Venetian neo-Aristoteleanism and empiricism which erupted as instruments of medieval reaction during the Sixteenth and Seventeenth Centuries, were implicitly and chiefly anti-Christian religious movements. That is to say, movements which sought to defend not only the medieval, but earlier practice of holding the masses of the population in a state of virtual bestiality, as human cattle, such as slaves or

Chris Lewis/EIRNS

LaRouche in Wiesbaden, 2003. In the tradition of Leibniz, the author talks with members of the international LaRouche Youth Movement about their mission in creating a new Renaissance.

serfs. This was done by placing the claims of financier-oligarchical usury above the principle of human life, that in the same spirit a farmer might cull a herd of cattle, for profit, convenience, or, as the Spartan tradition or the Emperor Nero would have done, mere amusement.

By invoking an irrationally arbitrary principle of dogma, such as John Locke's or Adam Smith's notion of "profit," in opposition to Christianity, in particular, as U.S. House Speaker Tom DeLay and U.S. Associate Supreme Court Justice Antonin Scalia's doctrine of "shareholder value" do today, those Venetian novelties known as neo-Aristoteleanism and empiricism defined themselves as pro-Satanic religions: as I shall show that connection here.

The relevant argument, which I have made frequently in earlier publications, may be fairly summarized as follows.

Were man merely a more developed form of higher ape, as Britain's Thomas Huxley and Frederick Engels insisted, the population-potential of the human species would never have exceeded several millions living individuals. Today, we have a reported population in excess of six billions. An argument to the same general effect was made by Russia's V.I. Vernadsky, in showing, on the evidence of geobiochemistry, that mankind expresses a power, of a principled form, which is categorically absent in such inferior species as the higher apes, a *noëtic* power typified by the discovery of experimentally valid universal physical principles.

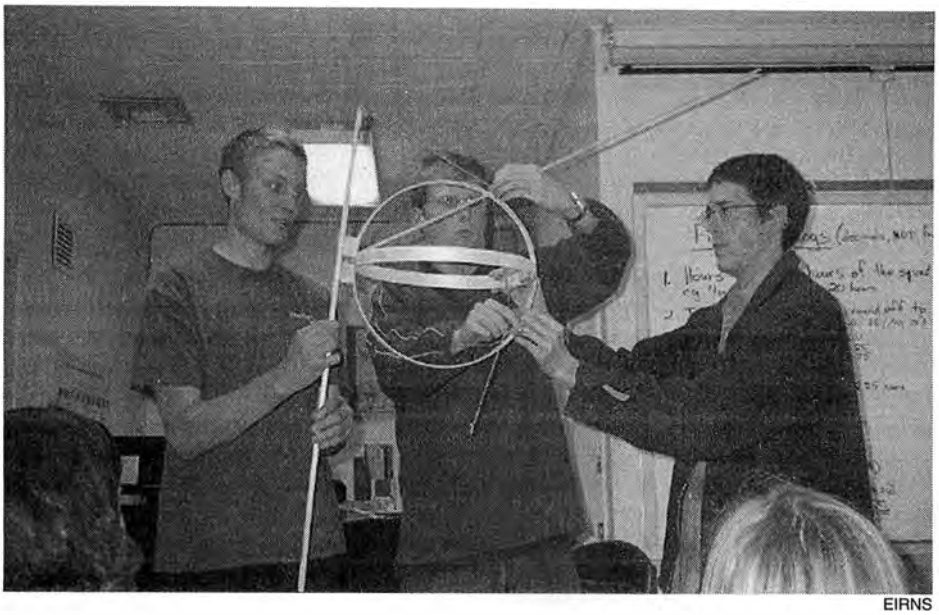
Vernadsky's successive definitions of the *Biosphere* and *Noösphere,* divided the known universe of experimental physical science among the three Classical categories which are now known to modern science by the names of the abiotic, the living, and the noëtic. These are, functionally, respectively, phase-spaces; they are, when taken together—as they must be to make sense of our universe—multiply-connected phase-spaces. This implicitly defines our known universe as *Riemannian,* in the sense of Bernhard Riemann's 1854 habilitation dissertation.[3]

Although Vernadsky's argument is grounded on the evidence of an experimental physics in the tradition of his teacher Mendeleyev, especially in an expanded view of physical chemistry, our ordinary sort of experimental knowledge of a relevant principle of life, and of a noëtic principle, remains essentially negative. We can demonstrate the presence, or absence of life; but, by the nature of the situation, a principle of life can not be positively affirmed from the standpoint of an ordinary abiotic physics. Thus, abiotic and living processes are shown, by experimental methods, to belong to respectively different phase-spaces, but both are, nonetheless, efficiently multiply-connected phase-spaces. Furthermore, all three—abiotic, living, and noëtic—are multiply-connected as a functional set. Similarly, the existence of the noëtic function, as distinct from that occurring in any known form of life other than man, is clear; but, the principle of noësis itself can not be accessed positively from the standpoint of an abiotic physics, nor even living processes in general.

Those difficulties should force our attention to a subject which was first defined for us, in terms of surviving literature, by Plato's dialogues. The human sense-perceptual processes are functions of our biology. Therefore, we can not claim that sense-perception shows us the world "outside our skins" directly; but, as Plato employs his allegory of "The Cave" to convey this notion, qualified experience does show that the human individual's matured sense-perceptual processes present us with the shadows which many among the processes outside our skins cast upon our mental-sensory processes.

For that specific reason, several years ago, I proposed to the members of my then emerging youth movement (principally of persons in the 18-25 age-interval of university students), that they remedy their present education by beginning with the ironies of Carl Gauss's definition of the complex domain, as encountered in his 1799 *The Fundamental Theorem of Algebra.* I proposed that they define the concept of an idea

3. Cf. Lyndon H. LaRouche, Jr., *The Economics of the Noösphere* (Washington, D.C.: EIR News Service, 2001).



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To combat the menticidal method of education prevalent today, the LaRouche Youth Movement is rediscovering the great scientific discoveries of the past, such as the solution to the problem of doubling the cube, the so-called Delian paradox. Here, youth movement leaders in Los Angeles, (from left, John Craig, Nick Walsh, and Tim Vance), demonstrate with a physical model how Archytas used a cone, torus, and cylinder to find the geometric means between two magnitudes and solve the problem of doubling the cube.

from the standpoint that 1799 paper proffers; and that they, then, organize their studies historically, as a matter of the history of ideas, as ideas are so defined implicitly. I have often repeated that proposal, as now, again.

I shall now show, that, from that standpoint, the referenced paradoxes posed by Vernadsky's presentation of the concepts of Biosphere and Noösphere, can be approached with some degree of approximate success. I explain.

The enduring elegance, and pure delight afforded by Gauss's first published work, his 1799 *The Fundamental Theorem of Algebra,* is that, although it is greatly indebted on that account to the education provided by his great teachers, Zimmermann and Kästner, it establishes the essentially relevant, direct connection of the modern tradition of Nicholas of Cusa, Leonardo da Vinci, and Leibniz to that tradition's ancient Classical roots in the founding of modern European science by the circles of Thales, Heraclitus, and Pythagoras. I shall begin the illustration of this specific argument by returning to the case of Kepler.

What Is a Universal Principle?

To repeat here what must be often repeated: Once we have abandoned the reductionist's misconception of space, as that is associated with Euclid, Descartes, et al., we are impelled to return to a pre-Euclidean, physical, constructive geometry, as typified by Archytas' solution for the Delian paradox, and the treatment of the physical implications of the Platonic solids by Plato, Kepler, et al.

This signifies to the mathematician that we must adopt the standpoint of spherics as the elementary form of the physical geometry of sense-perception. In that experimental domain of physical geometry, we are confronted with formally insoluble paradoxes, such as the case of the physical implications of the Platonic solids in demonstrating a difference in mathematical principle between abiotic and living processes. At that point, we must leave the department of mathematics, as Bernhard Riemann concludes his habilitation dissertation, for the department of experimental physical science.

Archytas' solution for the Delian paradox is perhaps the best point from which to start such studies. The advantage is, that two mean actions can each be represented in a visual way, but they, as actions by which the cube is doubled, are invisible to an attempt to view the actual doubling of the cube. This paradoxical picture, typifies the necessity of Gauss's development of the notion of the complex domain, and also affords us efficient insight into the physical implications of Riemann's leading work. From that point, proceed as follows.

Take as our first choice of illustration, Kepler's uniquely original discovery of universal gravitation, as sufficiently illustrated by his 1609 *The New Astronomy.* The evidence that, a) the orbit of Mars is virtually elliptical, and that b) the rate of change of the motion of the planet along that normalized set of observations of its orbital pathway is inconstant, signifies some agency from outside our powers of sense-perception is controlling this visible behavior. Similarly, Fermat's experimental demonstration that light follows a pathway of quickest action, rather than shortest (Euclidean) distance, provided the point of departure for the further work of Christiaan Huygens, Leibniz, and Jean Bernouilli, leading to the principle of universal physical least action, and Leibniz's uniquely original discovery of the catenary-related notion of natural logarithms. These kinds of experiences, throughout the scope of physical science, define that modern notion of universal physical principles, which is consistent with what was set into motion by Nicholas of Cusa's founding of the unfolding process of development of modern science, in his *De Docta Ignorantia.*

To repeat here what must be repeated from my frequent published statements to the same effect: By the nature of our processes of sense-perception, our direct perception of the world "outside our skins" (so to speak) does not show us that world "outside our skins," but, rather, the impact of that unperceived real world upon the biology of our mental-sensory processes. In other words, the shadows on the wall of Plato's Cave. However, it is a specific quality of the human mind, a quality absent in other living species, that we are able to adduce paradoxes from among the process-

es of sensed experience, and able to comprehend those paradoxes as experimentally demonstrable universal physical principles.

This specific quality of the human mind is congruent with the three-phase-space characteristic of our known experience of the universe as a whole: that from our standpoint, as Vernadsky made this distinction, the universe is composed of a multiply-connected array of abiotic, living, and human mental processes, such that the relatively lower can not access the specifically characteristic principle of the higher, but that the higher can access control over the lower. So, the attempt by radical positivists to adduce the principle of life from the abiotic, or the noëtic from biology in general, are to be classed technically as behavior symptomizing the typical effects of a reductionist's delusion. What that says, is that the universe as a whole, which is composed of a multiply-connected ordering among the three specific phase-spaces, acts upon all aspects of that universe. This works to the included effect of superimposing upon a specific quality of living organism, the human being, a quality of those noëtic powers which are typically expressed as that quality of human reason whose existence reductionists such as Kant and Laplace denied.

We, as individuals, are not some creature which evolved from the upward evolutionary progress internal to living muck; we reflect an intervention into that muck, from above, an intervention which distinguishes us absolutely from the apes.

For example: The most crucial of the issues of religious belief, are located in that way.

"By explaining the results of science in the fraudulent fashion a modern form of sophist would desire, it were feasible to train people in the practice of new technologies, without exposing them to the methods by which discoveries of universal physical principles had occurred up to that time."

The Religious Side of Empiricism

Notably, the monotheistic idea of God as the Creator of the universe, is an actual idea of the same specific qualities as any experimentally validated universal physical principle, one generated by the individual mind's power to form experimentally validatable, non-self-evident ideas. For example, consider the Aristotelean's self-evident conception of a Creator as a creature who, by creating the universe, had deprived himself of the power to alter the course predetermined by the laws built into the original creation. God the Creator is not an object of Creation, but a continually acting Creator; we are a particular (individual) expression of that process of continuing creation. We, as individuals, are a mirror of the image of that Creator. It is by expressing that creativity that we are acting as representatives of the human species.

This brings us directly to the crucial issue of the science of physical economy. The human being who follows faithfully in imitation of the traditional ways of economic life in which his or ancestors acted, as the code of Diocletian, for example, prescribes, is living as human cattle, not as a human being. He or she is behaving, not as a human being, but as a cow.

That cow is selected from the breeding process by qualities estimated to be fruitful for the cattle-herder, a process which sends some to early culling, slaughter. The cow who is privileged to survive, is "cared for," herded into the field, impregnated by the chosen bull, milked and fed in the barn, until the time for her culling (slaughter) has come. If it appears to the farmer that the bulls are being permitted to enjoy the cows, the farmer also watches the results of the breeding closely, to determine whether or not the progeny of those unions are satisfactory; if not, off to the slaughter-house with them! *The accountants have decreed: No expenditure wasted on health-care for those who have passed their productive prime!*

What distinguishes a person's life of labor from the nature of a mere beast? What else but freedom from the way of the medieval European guild!? Change, in the sense of development, is human freedom! It is the expression of the noëtic powers of the individual, as typified by a society committed to an upward track in scientific and technological progress, which distinguishes human beings, in practice, from beasts.

In a manner of speaking, a human personality is defined by what that individual accomplishes within the scope of that temporary visit to current history called individual life. However, important as such deeds must be, those deeds alone do not satisfy the more essential need of the mortal person. *The essential quality of human need is located in a social process based upon the individual's development for its own sake.* A person is what he, or she is the process of becoming. Becoming is those actions which express the fulfillment of the noëtic potential of both the individual as such, and the development of the society through the individual's interventions into its life. Human life is *noësis per se,* a particular expression of the universal creativity located in the Creator of the universe. *It is being such a person which is the highest condition of individual humanity.*

Such is human nature. Such is the premise of all natural law respecting human beings, physical science, Classical artistic composition, and society.

I shall return to this at a suitable point, later in this report. Now, return to the focus on physical science.

The Complex Domain of Noësis

If and when we discover and prove the efficient existence of a universal physical principle, we are implicitly confronted with the following problem of mathematical representation of that discovery.

Our discovery began with recognition of a special significance of a paradox in the evidence presented to us by our sense-perceptions. Kepler's discovery, through normalization of observations by Tycho Brahe and himself, of the paradoxical features of the elliptical orbit of Mars, is an example of this. Kepler sought the invisible principle which had caused this

anomalous effect; he sought what his translator termed "the intention"—the Creator's intention—which had produced that apparently anomalous effect. This intention he identified as his hypothesis respecting a principle of universal gravitation. Through measures he reported in that book, and also additional qualifications reported in subsequent writings, he accomplished four things of relevance, as examples, for our present discussion here.

First, he qualified his discovery of universal gravitation as not only an appropriate form of hypothesis, but an experimentally demonstrated universal principle.

Second, he developed a general observation on certain anomalies of mathematics previously addressed by Plato, and by such followers of Nicholas of Cusa as Luca Pacioli and Leonardo da Vinci, respecting the implications of the Platonic solids, and related implications for music.

Third, from this work he concluded the necessary former existence of a missing planetary orbit between those of Mars and Jupiter, the orbit of a planet which destroyed itself because of anomalous harmonic characteristics of its determined-as-necessary orbit. This Kepler hypothesis was essentially proven by Carl Gauss's discovery of the orbit of such principal asteroids as Ceres.

Fourth, he pointed to two incomplete features of his own discoveries, problems which he relegated to future mathematicians:

First, those future mathematicians must define elliptical functions. This problem was solved in essentials by the work of Gauss and his collaborators and followers, including Abel and Riemann.

Second, those future mathematicians must develop a truly infinitesimal calculus corresponding to the implications of Kepler's discoveries in gravitation. This was accomplished, first, both by the uniquely original discovery of such a calculus by Leibniz, and by Leibniz's subsequent refinement of that, in collaboration with Jean Bernouilli, in defining a universal principle of physical least action. The generalization of such a mathematical physics was accomplished by the work on reforms of taught mathematics of the time, which were accomplished through emphasis on those higher principles of geometry which had been evaded by the empiricists. This was brought to a rounded state of generalization, by a number of crucial successors of the circles of Gauss and Riemann, with an essential contribution by Abel. The generalization of this challenge by Riemann, was modelled on thinking in that direction accomplished by Gauss.

This sweep of the development of the hypothesis of universal gravitation into the form of an experimentally demonstrated universal physical principle, typifies the case I am addressing at this juncture. This referenced case illustrates crucial features of all human knowledge, and, therefore, of categorical distinctions of human nature from that of beasts and empiricists alike. Such experience of scientific progress also demonstrates several crucial challenges to those who would represent themselves as purveyors of mathematical physics.

Firstly, although discovery shows that the images of sense-perception are shadows of reality, rather than substance, we can not deny the role of sense-perception. Yet, experiment has shown that sense-perception as such does not represent the universal physical principles which control our universe, the universe whose passing footprint is reflected as the shadows of sense-perception. Therefore, to define any event, we must combine both elements, shadow and substance, in a single expression of the form typified by Gauss's definition of the complex domain. There is no "imaginary" component in that complex domain; what the empiricist fanatics D'Alembert, Euler, and Lagrange defined as "imaginary numbers," were an indispensable aspect of a reality in which real perception and real, unseen causes are united in a single form of representation.

This challenge, as met by Gauss beginning 1797 (as reflected in the 1799 *Fundamental Theorem of Algebra*), did not spring from a mere response to the blunders of Euler, et al. on issues posed by the Cardan problem of cubic roots. Gauss was a student of the Kästner and Zimmermann, who were among the leading proponents of the mathematics work of Leibniz at that time.

Look at the political history behind the prevalent present-day academic nonsense on the subject of the content of Gauss's 1799 paper. Leipzig-born Göttingen University Professor Kästner was the leading teacher of mathematics in Germany of that time, and also not only the leading, public defender in Germany of the work of two other names of Leipzig, Leibniz and J.S. Bach; but the mentor of another, the Ephraim Lessing who, in concert with Moses Mendelssohn, had virtually founded that late-Eighteenth-Century Classical Humanist renaissance from which the international Classical Humanist movement of the late Eighteenth Century spread throughout Europe and into the Americas.

Kästner was also the one-time host and helper of founder of the U.S. republic, Benjamin Franklin, and the German whose inspiration was crucial in rescuing Shakespeare from a British Enlightenment artistic garbage-dump, to give rebirth to England's own, great but discarded English literature; this done, in large part, through the revival of the true Shakespeare in Germany.

Kästner was also the founder of rebirth of that ante-Euclidean physical geometry properly recognized as anti-Euclidean today. Thus, when Gauss, nearly a half-century later, wrote to Jonas and Wolfgang Bolyai about Gauss's own original discovery of an anti-Euclidean geometry, Gauss was not referring to interesting so-called "non-Euclidean" geometries of Lobatchevsky and young Bolyai, but the kind of actually anti-Euclidean geometry declared by Bernhard Riemann in the opening paragraph of Riemann's 1854 habilitation dissertation. Essentially, as Gauss's argument in the 1799 paper attests, his views on geometry, as reflected in that 1799 paper, were already an anti-Euclidean geometry, one built upon modern supplements to the work of pre-Euclidean constructive geometry in the Pythagorean tradition.

The sponsorship of empiricist Lagrange's decrees by the Emperor Napoleon Bonaparte, would have almost extinguished Gauss's scientific career but for the intervention of the circles of the Ecole Polytechnique of France's Lazare Carnot et al. Gauss was a special target of persecution during portions of the reign of Napoleon.

Later, the dictatorship of Lagrange disciples Laplace and Cauchy, virtually wrecked the Ecole, a wrecking officially prescribed by the London-appointed Restoration monarchy of France; the hegemony of the empiricists was established under the ascending slime of Romanticism which spread throughout the scientific and artistic culture with the rise of Napoleon and the aftermath of the Metternich-Castlereagh (sexual) Congress of Vienna (where the counting of votes was done by countesses arranged in bedrooms according to the provisions of Metternich and the princedom's same Chancellor-run *Geheimpolizei* which spied against Beethoven during comparable periods of time). The letters of Gauss prompted by Jonas and Wolfgang Bolyai's complaints against Gauss's announcement of the originality of his own youthful discovery of an actually anti-Euclidean geometry, reflect, thus, the police-state atmosphere under which European science was still menaced during most of the later life of Gauss's sponsor Alexander von Humboldt.

Such is often the political history, even police-state history of science. Secret-police agencies and ministers of justice are often boorish fellows, but they, or their employers, have learned that real ideas are the most powerful forces in the history of mankind, such that a single idea, once spread, may be more powerful in shaping history than even a large army. The suppression of politically unwanted ideas, is the dominant feature of the history of brutal official and kindred forms of oppression. If one can not put the idea in prison, or, at the least, ostracism, putting the thinker there may produce the effect desired by his enemies, if, perhaps, as my own case has demonstrated, only temporarily.

"Man's ability to increase our productive power over nature, per capita, by willfully efficient intention, is the only true source of what might be called 'profit' and the accumulation of physical capital."

The fascinating feature of the history of ideas, such as those of the ancient Pythagoreans, Plato's Academy of Athens, the Fifteenth-Century Renaissance, Kepler, Leibniz, Gauss, Riemann, et al., is that these ideas sometimes spring forth afresh, sometimes after intervening leaps of many generations. In numerous cases, the rebirth of such an idea occurs as a rediscovery which was prompted by recognition of the work of a named discoverer, even thousands of years after his death. Some, reflecting on this, ask: "Has God intervened in the interest of justice?" In a certain way, the answer is "Yes." We who discover, or rediscover, are the instruments by which such seeming miracles may be accomplished, as if we were ancient prophets on a modern mission. The principle we express by such work, is the highest-ranking principle known to us as existing in the universe: the principle which sets us apart from and above apes such as Thomas Huxley professed himself to be, and such as Huxley's virtual pet baboon, H.G. Wells, who demonstrated the bestiality, perhaps sexually and otherwise, which he had been taught at his master's beckoning.

With the birth of each child, a potential discoverer appears, ready to revive and advance the cause of noësis. It appears to us, that the likelihood of such a happy outcome of that newborn human life usually depends upon the nurture of the young, and might be restricted, therefore, by the qualities of opportunities afforded to the young and adult individuals. Sometimes, what is justly recognized as a genius, erupts in seeming defiance of all those circumstances of individual life which would seem to have prevented such a happy outcome. The fact remains, that mankind has risen from that level of population of a few ape-like millions which appears, in practice, to have been the desire of such reductionists as the empiricists. Even the fanatically empiricist Euler was a very clever fellow, remarkably useful in some ways. The power which intervened to set the human species apart from, and above all other forms of life, expresses the intervention as a simmering potential, waiting to spring forth from each newborn human individual.

The crime to be prevented, is the suppression of that happy outcome in the young. Empiricism is such a crime against humanity, an offense against the Creator's clearly expressed intention.

Reductionism and Satanism

The difference, therefore, between man and beast, is expressed, in a unique manner and degree, by man's willful access to knowledge and control of what we have identified here as universal physical principles. The nature of man lies, thus, in the way in which the human mind is capable of comprehending what Gauss, in opposition to Euler and Lagrange, et al., defines as the complex domain. Reality is as Riemann states the principled case sharply in the opening of his habilitation dissertation. This is man in the image of the Creator.

The reductionists, from such traditions as the Delphi cult of Apollo, through the Sophists as such, Aristotle, and the modern intellectual and moral degenerates known as the empiricists, positivists, and existentialists, et al., either simply reject the notion of man as in the image of the Creator, or invent a diabolical concoction—such as that of Quesnay and Adam Smith—the willful demon which they proffer as a substitute for the Creator. Empiricists Hobbes, Locke, Mandeville, Hume, Adam Smith, and Jeremy Bentham, like Quesnay, quite plainly define what Smith calls "The Great Director of Nature" as a demonic creature expressing the same nature as the vice worshipped by Mandeville. Like Thomas Huxley, these other reductionists do not merely describe man as a beast; they also demand that society be ordered in such a way that morality of state, church, and individual alike, is defined, as Hobbes did, as the obligatory, predatory nature of beast-men. From the standpoint of science, there is no different definition of Satan and Satanism than that.

The motive for such Satanism as that of Sarpi, Hobbes, Locke, et al., is essentially political. If the majority of humanity is to be hunted or herded, and culled, as Locke's *Essays on Human Understanding* prescribe, as beasts are, then man must be defined politically, and by law, or in other

expressions of public immorality, as nothing better than a beast. This purpose of such wickedness is not merely to entertain a low opinion of, and predatory behavior toward one's fellow-creature. The purpose is to prevent those parts of humanity held subject to the status of human cattle, from learning to practice the kind of behavior which would cause them to recognize the essential distinction between themselves and beasts. This is accomplished by prohibiting the lower classes, such as the lower eighty percentiles of U.S. family-income brackets today, from actually practicing scientific and technological progress. The predator interest requires that the idea of actual scientific and technological practice be uprooted, or even made abhorrent, as the so-called "ecology movement" has expressed this maliciously intended perversion.

It is not possible for modern society, with its post-Fifteenth-Century population densities, to persist, if it were to resist scientific and technological progress altogether. Consequently, the feasible objectives of the predatory classes are: to tend toward inhibiting scientific and related progress when its immediate necessity can not be avoided; and, above all, to deny the subjugated strata of society the right to know the general principles for generating such progress; that, as a capability which is characteristic of the human individual. The object is to cause the victims not merely to believe that they are cows, but to be prepared to fight fiercely to maintain their proud status as mere cattle. Such was the intention of the Sophists, as this was exposed by Plato, and the intention of Aristotle after them. Such has been the intention of reductionists such as the modern empiricists and their offshoots, the positivists, pragmatists, and existentialists, since Sarpi. Such was the intent of Hobbes's "each against all," and of what Locke termed "property" and Justice Scalia "shareholder value." Modern science, as introduced by the Fifteenth-Century circles of Brunelleschi, Nicholas of Cusa, Luca Pacioli, and Leonardo da Vinci, has confronted the modern philosophical descendants of the Sophists with a new degree of challenge on this account.

The Fifteenth-Century Renaissance not only reversed the awful collapse of European population which was characteristic of the preceding century's "New Dark Age." The Renaissance set into a motion a long-term improvement of the standard of living and fecundity of the European and other, affected populations. The improved conditions of individual and social life unleashed by the Renaissance and its effects, depend upon a long-ranging trend of improvement in the potential relative population-density of mankind, a trend which depends upon realized scientific-technological and related cultural progress. Were this progress to be halted for a generation or more, the long-term effects would be a tendency toward a plunge into a new dark age, with deep levels of depopulation, and even eradication of entire branches of human cultures. Moreover, collapses of this class could not be prevented without new leaps in scientific-technological progress in the productive powers of labor and standard of living. No general turning back of the clock of progress were possible which did not lead into a catastrophic new dark age, perhaps a planetary new dark age. Since that Fifteenth-Century Renaissance, scientific and technological progress is now the law of civilization; cultures which resist that law will disappear, destroyed by their own will and hand.

Thus, the practice of modern European science since those developments within, and following the Fifteenth-Century Renaissance, presented the reductionists with a new threat: the emergence of a systemically practiced modern science; and, also, the related developments of Classical humanist modes of artistic composition; as both were but typified with a certain extraordinary excellence, by the intellectual fertility of Leonardo. Experience showed the reductionists that the role of a systemically practiced modern science must be attacked in a new way. A more vicious expression of the sophistry of Aristotle was required by them. The empiricism pioneered by Sarpi and his personal lackey Galileo Galilei, was the result.

Therefore, if it were not possible for a durable form of national culture to ban the impact of scientific progress from general practice of society absolutely, a sophistical sort of substitute for that science might be concocted. Galileo's fraud, "action at a distance," typified the result of such scheming. By explaining the results of science in the fraudulent fashion a modern form of sophist would desire, it were feasible to train people in the practice of the new technologies, without exposing them to the methods by which discoveries of universal physical principles had occurred up to that time. In this way, *by crafting the approved methods of teaching of the practice of science to the effect of making the victim of such education hostile to that essential principle—the Platonic principle of hypothesis defining the process of discovery of fundamental principles—the fruits of science might be plucked by the aristocratic rulers without letting the prestige of modern science infect the population with what the reductionist sort of political philosophers and kindred scoundrels might consider to be excessive admiration for the practice of scientific progress. Therefore, by such "brainwashing" of popular opinion, they might suppress what might be deemed excessive enthusiasm for the sacred distinction of the human individual.* So, lunatic Newton wrote: "hypothesis was not necessary." So, during the 1890s, after he had been driven insane by his persecutors, Georg Cantor repudiated his great achievements of the preceding decade by writing the same lunatic's motto, "hypothesis was not necessary."[4]

Appropriate study of the case of Gauss's 1799 theorem, neatly illustrates the way in which the empiricist frauds of

4. Georg Cantor, *Beiträge zur Begründung der transfiniten Mengelehre*, 1897. English translation published as *Contribution to the Founding of the Theory of Transfinite Numbers*, reprint of the 1915 Jourdain translation, with extended introduction by Philip E. B Jourdain (New York: Dover Publications Reprint edition). Under the impact of a savage, inquisitional quality of attack, led by Leopold Kronecker, the brilliant Georg Cantor of his middle 1880s work fell into fits of insanity which orbitted around an embarrassing effort to induce Pope Leo XIII to adopt the method of Isaac Newton. The theosophist Rudolf Steiner and Bertrand Russell came to play typical, pathogenic roles in fostering some of this problematic behavior. However, apart from the importance of his *Grundlagen* and his complementary correspondence on that subject during the middle to late 1880s, there was a deeply humanistic side to Cantor, which he identified with his ancestor Josef Böhm, the collaborator of Beethoven on the performance of the late quartets, and the method of the Böhm school of violin performance of which Cantor was a qualified amateur performer.

Sarpi, Galileo, Euler, Lagrange, et al., were crafted.

As I have repeatedly restated my frequent argument in this report, the scientist's distinction of the human being from the beast, points to the fact that what are demonstrated experimentally to be universal physical principles are ideas which exist beyond the direct reach of human sense-perception. They are known only through the process of hypothesizing, as Plato's dialogues, or the earlier precedents of pre-Euclidean Greek constructive geometry illustrate that fact. The consequence of this knowledge of the nature of such principles is that modern mathematical physics is obliged to combine the apparent action, as sense-perception defines action, with those discovered universal physical principles which exist only beyond the direct reach of sense-perception. The functional interrelationship of these two is the reality of the complex domain.

The use of the term "imaginary" for the square roots of negative numbers, as by Euler and Lagrange, is provocative. These are really imaginary in one sense of the use of that word, but only in the sense that they are the most significant aspect of a reality, an *image* of a reality reachable by human knowledge only through the human individual's power of hypothesizing and proving hypotheses experimentally. Yet, Euler et al. insist that these so-called "imaginary" components of mathematical-physical reality are not real; and they misuse the word "imaginary" as a sophist's way of lying, by denying that these elements are not merely real, but indispensable for scientific progress.

The Satanic aspect of their misuse of the term "imaginary," is made apparent by considering the categorical nature of the effect their sophistry concocts. They not only deny a truth which is important for the continued existence of our species; they prohibit man from knowing his own nature, and thus degrade the credulous students of their doctrine into a form of mere human cattle. *That is Satanic!*

2. Science & Passion

For example:

Most among today's teachers and professors of mathematics are, in effect, clinically insane in their customary treatment of that and related subject-matters. The experimental proof of that fact has been lately demonstrated, more or less widely, on two continents, North America and Eurasia. It is implicitly demonstrated on all of them.

In the U.S.A. itself, the presently generally accepted practice of public education has reached the proportions of what might rightly be called "menticide." *The textbooks, examination-and-grading procedures, and teachers and professors of this quality, assume that the consistency of a closed deductive-inductive system, if perfectly consistent in its own chosen terms, is therefore real knowledge.* That form of sophistry, as practiced by such persons and institutions, is, in fact, a form of nothing other than clinical schizophrenia: a form of what may be called either "legalized," or "popularized" schizophrenia.

This point is more or less readily demonstrated to be true, by challenging almost any professor of mathematics or mathematical physics who merely accepts that notion of mathematical consistency in defiance of the issues posed by Carl Gauss in his 1799 *The Fundamental Theorem of Algebra*. The customary reaction from that professor, if challenged in an efficiently rigorous way, will be a sudden explosion into the type of utterly irrational, childish tantrum specific to a mental disease. The instances of specific tantrums of that wildly irrational type, from such pedagogues and the like, continue to be numerous.

The pedagogical point I am emphasizing in introducing that issue of sanity at this moment, is that the pretense of that sort of mathematician, or mathematical physicist, is his claim that his claimed objectivity is intrinsically unemotional. In other words, he or she assumes that physical science is based on reductionist mathematics, and that that mathematics is purely deductive-inductive. The explosion of emotion in the referenced sort of tantrum, proves that they, as professionals, are living a very, very emotional, big, very personal, lie. By identifying the fallacy of the definitions which they have adopted as a substitute for the real, physical universe outside their *Laputan* fantasies, a knowledgeable critic can trigger a clinically crucial, insane outburst from them.

Their insanity has principally two aspects. The first principle of their *systemic insanity,* is their delusion, that truth is "objective": rooted in the combination of sense-perception with a set of purely fictitious choices of sets of deductive forms of definitions, axioms, and postulates. The second principle, which is assumed to be a correlative of the first, is that emotion has no place in mathematical, or comparable modes of supposedly reasonable thinking. In point of fact, their minds are like goldfish swimming in a bowl, such that, for them, nothing exists outside the water contained within that bowl. In their mathematical schemas, the reality of mathematical physics exists in a goldfish bowl-like sub-universe, from which emotion and reality, alike, are shut out. To cause a leak in that container which holds the water, unleashes a flood of emotion in them.

We who might have provoked this reaction, did not actually cause that emotional display by them. We simply unlocked it, like tapping on a vial of overheated nitroglycerine. The explosion was an expression of the brutal repression which had been their continued experience, usually since childhood. This emotionally charged repression, this, their internalized Gestapo, had been the mechanism by which they were conditioned to adopt the ivory-tower assumptions at issue. The emotion expressed by the irrational outburst of emotion by them, was the result of pushing their attention to the fact of the container in which their delusory notion of mathematical principles was contained. The container was of the ontological quality of a fear-stricken emotion of repression. That fear is what had imprisoned them, acting to this effect as what we experience from their wildly irrational outbursts, as the habituated set of emotional shackles on their minds.

The emotion expressed by their explosions of irrational rage, was the "force" which herded them into the set of so-called self-evident assumptions which they had pretended,

until provoked, to express in an emotion-free way. That was the "force" of intellectual repression. When you made visible the barrier which contained their conditioned-as-emotion-free views; by merely making that barrier visible, you touched off the explosive charge that barrier represented.

One must add, that provoking such a reaction in that way, is not "doing a bad thing;" it is not a violation of what we could, defensibly, call polite behavior. Only if and when such a professor has, first of all, experienced such a "catharsis," will he or she be capable of becoming sane. It is not naughty to make lunatics sane; quite the opposite. Thus, telling the truth will usually touch off those or similar kinds of explosions of anger; the way to avoid such outbursts is to condone and nourish the lies, which is itself a form of lying commonly practiced by cowardly candidates for the U.S. Presidential nomination, and others.

Take the case of Euclidean geometry as an example of the way in which such forms of functional schizophrenia function.

The Thirteen Books of Euclid, are like a Scotsman's *haggis,* a lot of things, picked up from here and there, and stuffed into a kind of pudding. Many of the pieces which might be picked out of that pudding were generated as fruits of serious, competent investigations. When the pudding is taken as a whole, the arrangement among the component parts is riddled with paradoxes, especially respecting the contents of the Tenth through Thirteenth of those books. Those latter books should be recognized as implicitly contradicting the set of so-called self-evident definitions, axioms, and postulates, on which the entirety of the content of *Euclid's Elements* depends.

The paradoxes reflected there, are a result of the fact that Euclid has replaced the real domain of "spherics," from which the ironical content of the Tenth through Thirteenth books was, chiefly, derived, by a childish fantasy-world in which objects are floating within an imaginary soup of linear space and time. The most critical features of the last three books, reflect the contributions of the pre-Euclidean, constructive geometry. This latter is the geometry which the Pythagoreans, et al. derived, as "spherics," from the kind of interrelated knowledge of astronomy and oceanic navigation which the emerging Greek culture derived chiefly from that Egyptian tradition typified by the design of the Great Pyramids. The error of the Euclidean or kindred sorts of *a priori* definitions, axioms, and postulates, is what polluted the so-called "mainstream" of European science's mathematics, as Riemann reported in the opening two paragraphs of his 1854 habilitation dissertation.[5]

Riemann thus reaches back to a time prior to Euclid. In fact,

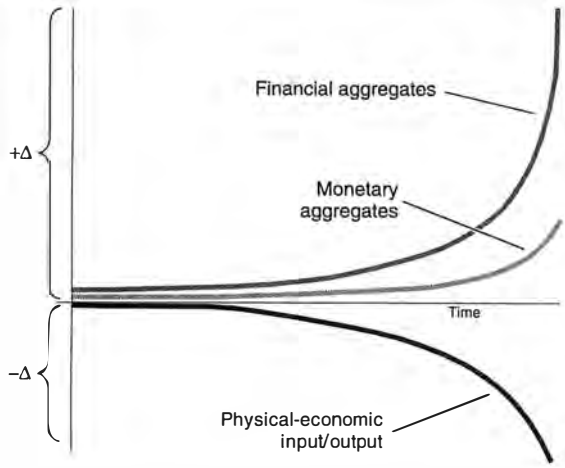


Figure 1
LAROUCHE'S TYPICAL COLLAPSE FUNCTION
LaRouche's "Triple Curve" schematic diagram, first presented in 1995, shows how the cancerous rise of financial and monetary aggregates destroys the physical economy at an increasing rate.

he combines the historical tradition of the pre-Euclidean, constructive geometry of "spherics," of Thales, Heraclitus, the Pythagoreans, and Plato, with the principal accomplishments of modern science since Nicholas of Cusa's *De Docta Ignorantia,* the latter including the work of such successors of Cusa as Leonardo da Vinci, Kepler, Fermat, Huygens, Leibniz, and Riemann's principal predecessor, Carl Gauss. Following the line of Gauss's 1799 attack on Euler, Lagrange, et al., in Gauss's *The Fundamental Theorem of Algebra,* Riemann makes the most crucial of the steps which implicitly free European civilization's science from the relics of thousands of years of reductionist decadence.

My own, 1948-1953, crucial original contributions to Leibniz's 1671-1716 founding of the science of physical economy, had the specific, crucial significance of resolving what C.P. Snow fairly named the "two cultures" paradox of contemporary education. That is to say, the division of physical science from Classical art. My solution to this "two cultures" paradox depended upon showing the common ontological characteristics of Classical artistic principles of non-plastic art and scientific discovery, the latter as expressed by increase of the productive powers of labor through technological progress.

As a result of that work, which was done at sundry intervals of 1948-1953, I was able to eliminate the need for efforts to derive principles of political-economy from monetary processes, as the British Haileybury school had done; and, instead, to define monetary processes from the standpoint of comparative *potential relative population-density* (per capita and per square kilometer). The organization of my effort had the following features of relevance for the subject of the present report. Since late 1995, I have illustrated the effects of applying that method of physical economy, to design of a series of

5. From the Henry S. White translation, in D.E. Smith, *A Source Book in Mathematics*, New York, 1959. "It is well known that geometry presupposes not only the concept of space but also the first fundamental notions for constructions in space as given in advance. It gives only nominal definitions for them, while the essential means of determining them appear in the form of axioms. The relation of these suppositions is left in the dark; one sees neither whether and in how far their connection is necessary, nor *a priori* whether it is possible.

"From Euclid to Legendre, to name the most renowned of modern writers on geometry, this darkness has been lifted neither by mathematicians nor by the philosophers who have labored upon it. . . ." For the German original of those opening paragraphs, see Bernhard Riemann's Gesammelte Werke, H. Weber ed. (New York: Dover Publications reprint, 1953), pp. 272-273.

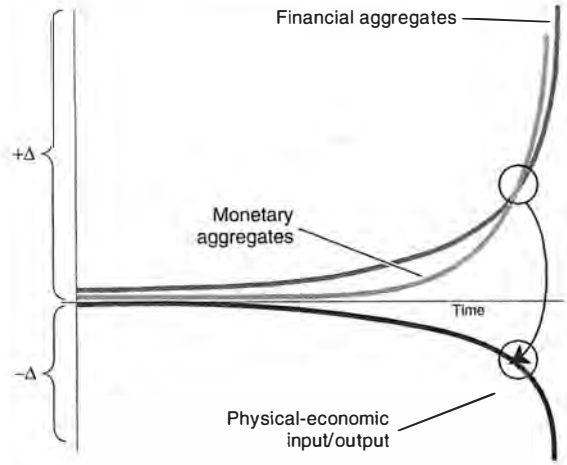
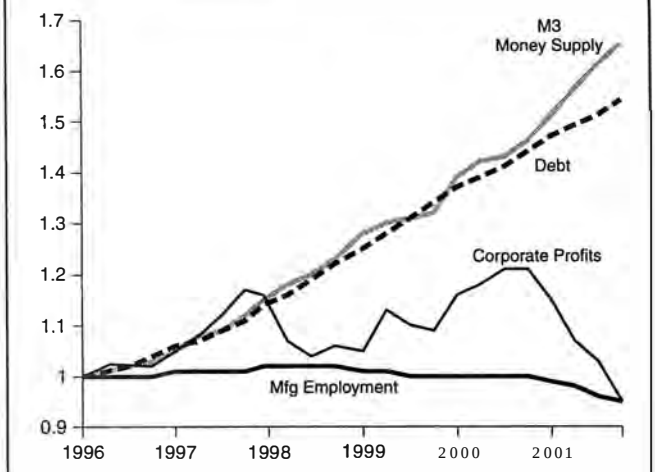


Figure 2
THE COLLAPSE REACHES A CRITICAL POINT OF INSTABILITY

This elaboration of the "Triple Curve" shows the onset of hyperinflation, as the values for monetary aggregates exceed the financial aggregates. This began to occur around the onset of Federal Reserve Chairman Alan Greenspan's Y2K "wall of money" policy at the end of 1999, as Figure 3 shows.



Source: EIRNS.

Figure 3
THE U.S. ECONOMY'S COLLAPSE FUNCTION SINCE 1996

pedagogical charts [Figures 1-5], comparing relative changes in physical output with those expressed as monetary and financial aggregates. These charts cut through the nonsensical estimates of the U.S. economy which have been prevalent during the 1996-2003 interval of the Clinton and Bush administrations.[6]

I describe the most relevant aspects of the process of my discovery as follows.

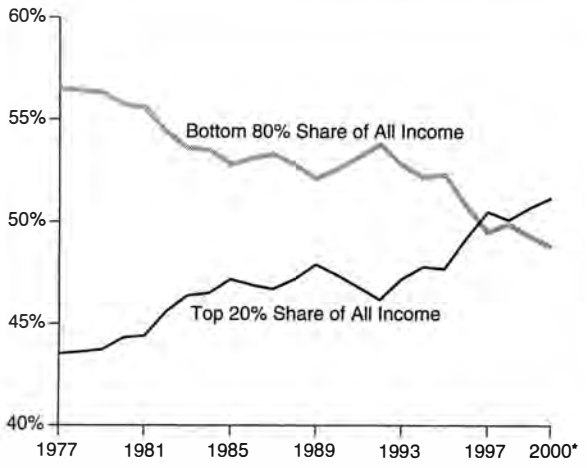
Targets: Wiener and von Neumann

The best way to convey any idea is to present the relevant audience with the process of experiencing the unfolding process of the idea's discovery. So, as Friedrich Schiller emphasized, the Classical stage is the best medium for the study of history. The member of the audience, seated perhaps in the balcony of the Classical theater, relives the history, or history-like legend on the stage of his or her own imagination. Seeing the doom gripping the leaders of a society unfold, on that stage of the imagination, the ordinary citizen is inspired to judge the principles which have brought an entire society to its tragic or sublime outcome. Thus, as Schiller reports, the ordinary citizen, so uplifted to the status of statesman, leaves that theater a better person than he entered it a few hours earlier. The same principle applies to the proper method for teaching science. The mastery of science is the reliving of the actual historical process of discovery and transmission of ideas. What must be retained is not textbook-like recollection of the formal, dictionary-like features of a discovery; what must be acquired is a memory of a relived experience, the experience of reliving the process of the relevant discovery and its transmission to present times. Proper education in science, is science re-enacted, and relived, as an historical drama, in the mode of a Classical tragedy or the like.

For me, my cultivated antipathy, since early childhood, toward learning something merely because it was the taught, or the popular view, impelled me, from about the age of fourteen, to take up an intense reading of English-language editions from among the best-known writings of the leading English, French, and German philosophers of the Seventeenth and Eighteenth Centuries, from Francis Bacon through Immanuel Kant. This was prompted, in part, by my sense of horror at being confronted with such shibboleths as what I later considered as the plainly fraudulent, purportedly self-evident definitions, axioms, and postulates of my first encounter with a standard Plane Geometry. My adolescent search for truth was soon steeped in enmity against what I have identified here as "reductionism." By about the age of sixteen, I had become a follower of Leibniz engaged in preparing a refutation of the principal thesis of Kant's first *Critique*.

By the close of the 1939-1945 war, I was occupied with the relationship and systemic distinctions among the three

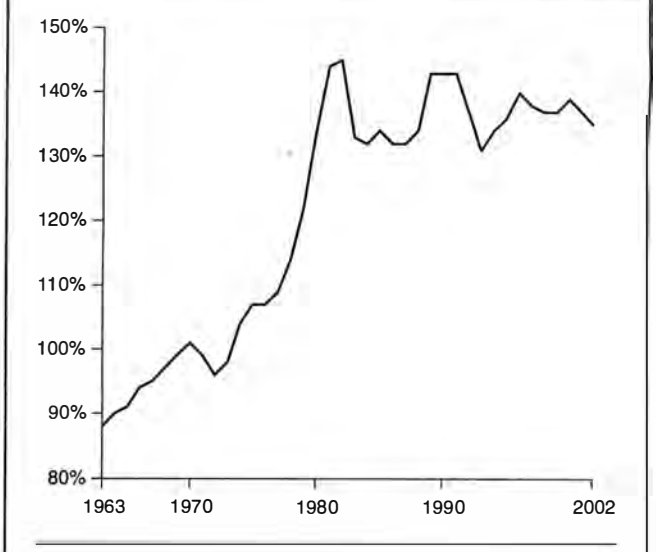
6. As I pointed out in an early 1984, half-hour network TV broadcast: By about the end of 1983, the Federal Reserve System and U.S. government had introduced a monstrous fraud into the official reports on the state of the national economy. This hoax was called the "Quality Adjustment" index. It is now sometimes described as the "hedonic index," a notion derived from British East India Company utilitarian (and coordinator of the British-directed Terror in 1789-1794 France) Jeremy Bentham's 1789 *An Introduction to The Principles of Morals & Legislation*. This was the same Bentham of the kindred, short but notorious piece, *In Defence of Usury*. Since 1983, all official U.S. reports on inflation and economic growth have been a worsening gigantic fraud, as the continuing, post-1977 fall of the relative physical standard of living (market basket) of the lower eighty percentiles of U.S. family households attests.



* = projected
Sources: Congressional Budget Office; *EIR*

Figure 4
TOP 20 PERCENT OF POPULATION HAS MORE THAN HALF OF ALL AFTER-TAX INCOME

The decline in real incomes of the lower 80 percent of American family-income brackets is suggested by Figures 4 and 5, which give the lie to claims of a "recovery." Households have been forced to take on more jobs, longer work hours, longer commutes, and more debt, in order to survive.



Sources: U.S. Department of Commerce; National Association of Home Builders; The College Board; U.S. Department of Labor, Bureau of Labor Statistics; *EIR*.

Figure 5
COMBINED HOME, CAR, MEDICAL, COLLEGE, AND FOOD PAYMENTS AS PERCENT OF AVERAGE PAYCHECK

Classically defined categories of abiotic, living, and cognitive processes. How does the mind generate an idea, which is an unseen but efficient principle? For a period, I wrestled with the implications of William Empson's *Seven Types of Ambiguity,* with the purpose of identifying those features of Classical irony, as in poetry, which corresponded to the relationship between systemic paradoxes and successful hypothesis in physical science. It was a continuation of my adolescent occupation with affirming Leibniz against Kant's *Critiques.*

Against that background, in January 1948, I was loaned, through Professor Norbert Wiener's daughter, a copy of the Paris pre-publication, reviewers' edition of his *Cybernetics.* That date is significant only because the chain of developments leading to my discoveries in physical economy began under those circumstances. By March of that year, I was deeply committed to the intent to refute Wiener's argument for "information theory." The portion of the book devoted to control mechanisms, was delightful. The use of the term "cybernetics," to signify what Wiener defined as information theory, was a hoax, a logical positivist's intellectual horror-show. Since that time, most of my intellectual life has been entwined, in one way or another, in warfare against the pure evil typified by Bertrand Russell and such among his numerous, self-dehumanized devotees as Wiener and John von Neumann. The point of reference for my argument against the specific evil of Wiener's notion of an "information theory," was as follows.

In competent science, we begin the discovery of a principle, or student's-like reaction to such a discovery, with attention to a systemic paradox. Kepler's discovery of the implications of the Mars orbit, is a model case. The successful composition of a Platonic form of Socratic hypothesis defines a conjectured principle which might solve the paradox. This conjecture, that working hypothesis, requires a specific kind of experiment, something corresponding to a proof-of-principle experiment.

If the experiment were successful proof of that principle, we adduce from the relevant design of that experiment, certain features which directly echo the tested principle. So, we are able to proceed from the work of the laboratory-experimental machine-tool or comparable designer of the experiment, to the application of those features of the experimental design which reflect the newly defined principle.

In a general way, this is the image of the role of technology in the improved design of products and processes of production.

Reflect on what was going on stage, so to speak, as that procedure from paradox to new technology unfolded. The beginning of the process occurred within the sovereign cognitive processes of an individual human mind. The development of the appropriate hypothesis, and its experimental or equivalent validation, produced a technology by means of which man's power over nature, per capita and per square kilometer, was increased. Contrary to Wiener, the radically reductionist statistical method of Ludwig Boltzmann has no place in this process. In representing the increased physical power of labor as a result of a statistically ordered process, Wiener had com-

mitted a fraud: a fact which would not have astonished the David Hilbert who threw both Wiener and John von Neumann out of Göttingen University for their committing precisely such kinds of hoaxes.

I do not accept Hilbert's delightful, descriptive notion of what he describes as (what translates from German as) the "intuitive" methods of pure geometry which are essential replacements for standard classroom algebra, for purposes of crucial aspects of advanced scientific work. Nonetheless, I recognize his intention to refer to something valid, something which I do recognize as a real phenomenon of human creative work, but which I locate in what would be considered the strictly Platonic methods of the Pythagorean tradition, as I do in my present report here. Better than "intuition," were "insight." However, whatever terms are used to refer to the phenomenon, it signifies the Classical Greek *noësis,* a quality which distinguishes human beings from apes, man as made in the likeness of the Creator. Call it "intuition," or not, the intent of Hilbert's argument on this point coincides, in fact, with my own ontological sense of what Classical tradition defined as the *noëtic* quality of cognition. In all that I have read from the work of both Wiener and von Neumann, and of their kindred modern sophists, that quality of scientific insight is precisely what is conspicuously lacking, even willfully, savagely excluded.

This (noëtic) power of creativity is not something which was done *to* man; it is a sovereign power *of* the individual person. It is not man acted upon by creativity; it is man expressing that creativity which is already embedded in his nature.[7] This is an agency outside the reach of both abiotic and merely living processes, as Vernadsky followed the relevant Classical Greek tradition on this point. Just as the principle of life exerts an increasing role in determining the geological development of the planet as a whole, so the human creative principle uniquely specific to the sovereign human individuality, has the power to transform both the abiotic and living processes in general. Thus, were mankind, whose population is presently reported to exceed six billions persons, merely a higher ape, the living population would have never exceeded several millions.

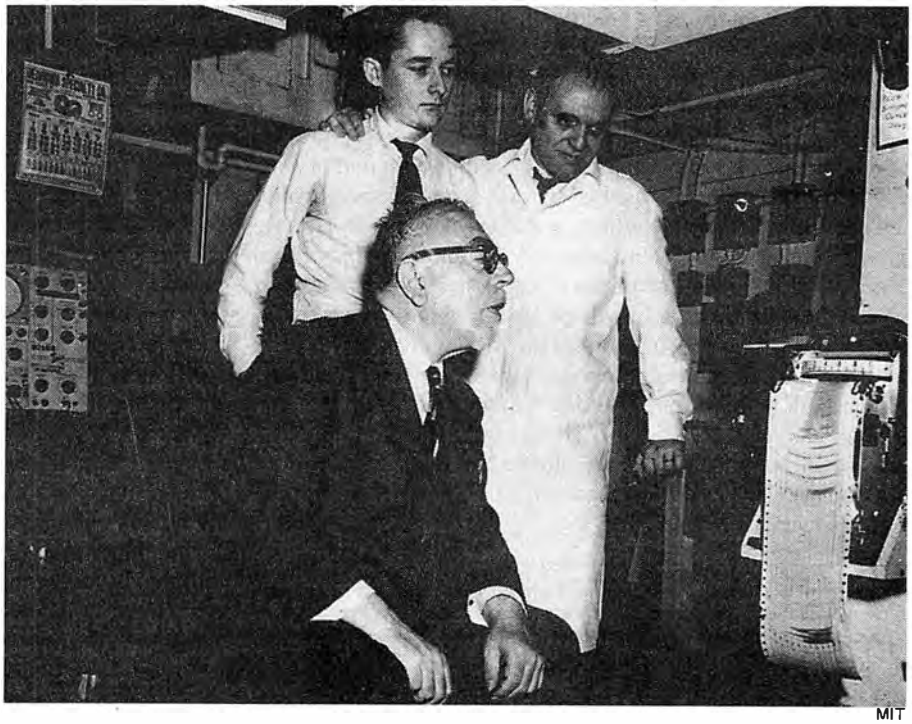
Man's ability to increase our productive power over nature, per capita, by willfully efficient intention, is the only true source of what might be called "profit" and the accumulation of physical capital. Such is mankind's power to increase the human species' power to exist, something which can occur among lower species only through an evolutionary upshift of species, not by any willful potential available to that species.

That is not the end of the argument against Wiener, von Neumann, et al. The development of the productive powers of labor, is generated by individuals, but its realization is social, not merely individual. This brings us to the principal follies of Wiener, von Neumann, et al., the subject of human communication.

'Communication Theory'

In that increase of mankind's power to exist which is generated by newly discovered universal physical principles, there is an element which is uniquely sovereign to the individual mind. How is such an element transmitted, as communication, from one mind to another? Each such discovery is a revolution, for which nothing existed within the realm of that person's sense-perception, up to that point. Therefore, it would be clear that no literal statement within the existing language could contain the relevant communication of the pertinent new idea. With that, the claims to a body of "statistical communication theory," such as that of Wiener, von Neumann, or MIT's Marvin Minsky, break down.

This brings us back to the ambiguities posed to me implicitly by Empson's work. That brings me back to a long-favorite passage from P.B. Shelley's essay, "In Defence of Poetry," and to some fascinating work by one of my favorite American spies, Edgar Allan Poe. During certain periods,



MIT

The Null Set: Information theorist Norbert Wiener contemplates the record of his own brain waves, emerging from a newly developed computer in 1955.

7. E.g., the Creator did not deprive himself of the power to change the universe by creating it. Note the importance of the German educator Herbart for both Riemann and, later, Georg Cantor, on this point. Whatever is discovered to be a validated universal physical principle, is a definite object. See Riemann's *Werke,* on "Geistesmasse," "Zur Psychologie und Metaphysik," pp. 509-520. This Herbartian ontological feature of the work of Riemann and Cantor was crucial for me in 1952-1953.

there is an increase of "the power of imparting and receiving profound and impassioned conceptions respecting man and nature." What Shelley references thus, is the power of irony and metaphor associated with the great Classical humanist resurgence of the late Eighteenth Century. Compare the case of the famous Third Act Hamlet soliloquy: "To be, or not to be. . . ."

Language uses ambiguities arising in the use of language, or mathematical physics (for example), to define systemic paradoxes having the quality of distinctness shown by Kepler's reflections on the implications of a corrected image of the Mars orbit. These are the ambiguities, of a validatably systemic quality, which point toward the sovereign creative powers of the individual human mind, toward the discovery of a relevant hypothesis. By the same means, the use of well-crafted ironies, such as metaphor, one mind is able to provoke another to replicate ideas which can not be explicitly stated in previously established use of language as known previously to those engaged in that communication. This generation and receipt of such communication is accomplished through the principle of Plato's Socratic hypothesis.

When Wiener, for example, sought to argue that an anti-entropic progress in the human condition could be effected in ways determined by Boltzmannian statistical mechanics, he perpetrated a fraud, as Hilbert would have understood Wiener's behavior on this account. The theory of the brain, of mathematical economics, and of artificial intelligence, by von Neumann, were frauds of the same general class of hoaxes.

These considerations led me, by 1953, to a preliminary general notion of the differences and consonances of the principles of composition of Classical non-plastic art and of physical science. Both taken as one, define a validatable science of physical economy.

The increase of the potential relative population-density of the human population, demands a relevant source of anti-entropy.[8] There must be, first, the specifically anti-entropic characteristic of living processes, as distinct from that of abiotic processes. There must be, second, another specifically anti-entropic influence which is otherwise absent among inferior living species, but specific to human beings. The function of a science of physical economy, is to define the kinds of measurements by which society might successfully define some of those policies which will lead to net improvement of the human condition over a span of several generations to come. The development of such ideas by individuals, is not sufficient. There must be a communication of such and also certain other classes of ideas within the society. This latter task has two principal, relatively distinct aspects.

First, there is the matter of the communication of specifically anti-entropic ideas among individuals, as I, not Wiener, have summarily defined anti-entropy above. Second, there must be the discovery of an additional class of universal principles which, like what are ordinarily considered physical principles, pertain to the necessary ordering of social processes.

Society is not a simple aggregation of individual or otherwise local activities. A modern national economy, for example, is a kind of "social organism," in which the most significant effects are a reflection of individual actions directly on the economy as a functionally indivisible whole, rather than as an accumulation of localizable effects. This means that the members of a society must, to a very large degree, subordinate what local experience suggests to be their interests, to a superior definition of that local interest as defined by proceeding from the society as a whole, rather than the particular to the whole.

There are maddened fanatics who seek to deregulate everything, arguing that any interference with their antic impulses were not merely a wrongful assault on their individual will, but necessarily bad for the society as a whole. This lunatic view was that proposed by Mandeville's paean to vice in his *The Fable of the Bees;* in John Locke's notion of "property"; in Quesnay's *"laissez-faire"* doctrine that peasants are merely cattle; and in Adam Smith's 1759 *Theory of the Moral Sentiments* and 1776 anti-American propaganda-piece *The Wealth of Nations.*

In fact, approximately half of the allotted effort of a healthy form of modern nation-state economy, is expended to produce and maintain those forms of basic economic infrastructure which are of general importance to the economy of that region, rather than merely to some particular enterprise within that area. Generation and distribution of power, water management, general transportation, health-care systems, educational systems, urban organization, and so on define the characteristics of the general environment within which individual activities are situated.

For example, two ostensibly identical factories situated in different environments will have different characteristic physical productivities. The quality of sources of generation and distribution of power, development of water resources, and so on, are relatively more obvious. Then consider the lower productivity of the plant, if placed in an area which relies on highways rather than modern mass-transit systems for passengers and freight. The inherent social cost of the highway travel is greater per capita, and the time lost by reliance on highway transport is multiply a cost-factor, that for reasons which include the substantial, if indirect effects of a diminishing of the quality of family life.

The development of infrastructure coheres with level of technology in defining the geometry of the society and its economy as a whole. The addition, or elimination of some of the functional elements which characterize that society as a whole, will determine a variation in the productivity expressed by the individual firm so situated. The source of this variation is not the firm, but the general economic infrastructure's impact upon the actions occurring within the firm. This relationship between infrastructure and individual enterprise is of

8. The term "anti-entropy" is coherent, both formally and functionally, with "anti-Euclidean." The concept is of the type associated with the Classical paradoxes of doubling the line, square, and cube, in the Pythagorean mode of pre-Euclidean constructive geometry. The shadowy effects of such procedures in defining relatively higher orders of existence can be described in algebra, but the process of generation of those results belongs entirely to the domain of constructive geometry, as the case of Archytas solution for doubling the cube typifies this. Again, the notion of anti-Euclidean geometry is not to be confused with a merely non-Euclidean geometry.

the form of a Riemannian geometry. The interpolation of a short explanation of that, will suffice here.

Man in the Universe

The crucial paradox presented by realized forms of application of fundamental physical principles, is the following.

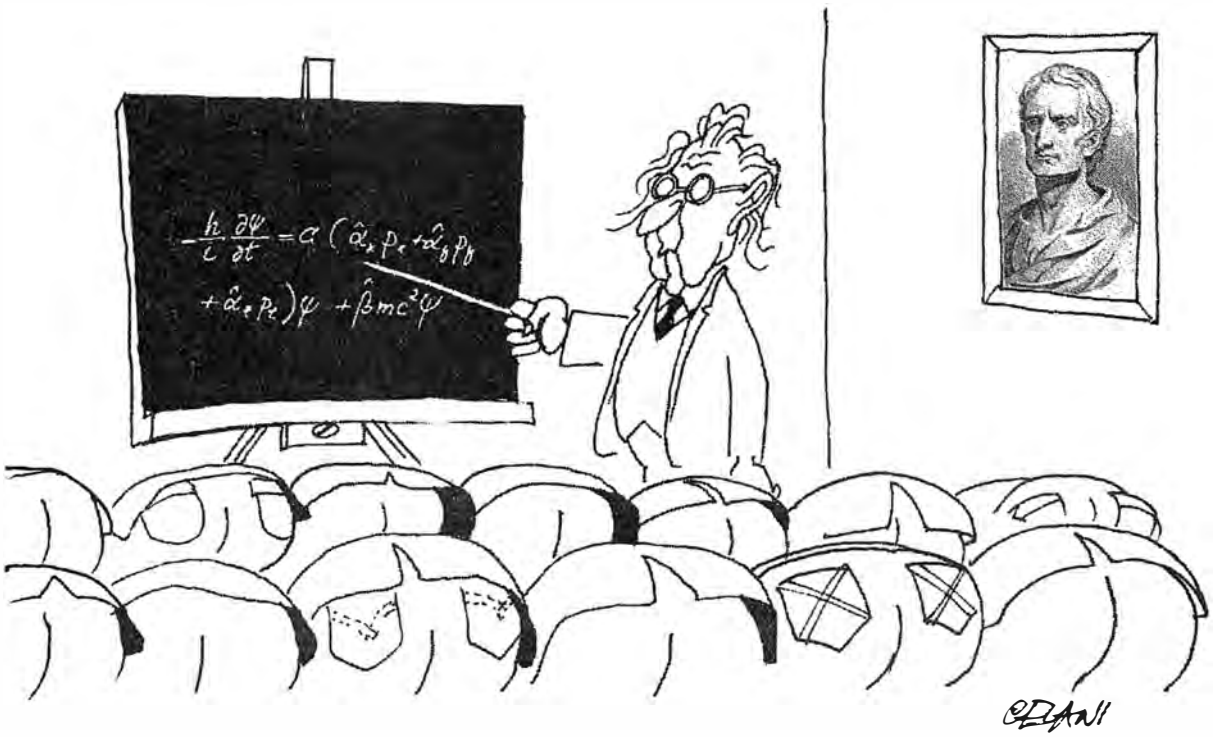
What man discovers, in uncovering a universal physical principle, as Kepler discovered universal gravitation, is a pre-existing principle of the universe. Generally, we think of this in terms of principles presumed to exist prior to the appearance of mankind. When man discovers and applies such a principle to change the universe, he has not added an absolutely new principle to the universe; but, the added re-application of that pre-existing principle to the universe, by the will of mankind as discoverer, changes the universe.

We must therefore think of physical geometries of the universe along the following lines.

The immediate physical-geometry of reference for us, is, in first approximation, the universe as represented by a set of principles whose effects we know. If the universe contains *m* principles, we know a mere portion, *n,* of such principles. Can man increase the number of principles corresponding to *m?* When man applies a discovered universal physical principle, such as controlled nuclear fission or fusion, we change the universe; this effect occurs not by our discovery of that principle's existence, but our willful application of that principle to produce new kinds of principled states of existence in the universe, kinds of effects which did not exist prior to man's such willful action. New elements and isotopes are merely typical. If we could control what we define experimentally as matter-antimatter reactions, that would be quite stunning. That seemingly paradoxical effect is perhaps the most intellectually stunning expression of man's creative nature.

In all cases, a change in those aspects of our physical-space-time geometry which are more or less immediately important for society's present functions, may alter the way in which ordinary action occurs in the detailed features of social and economic life. Generally, man's power over nature increases, and man's ability to accomplish positive actions is sped up. The tempo of processes may be accelerated or slowed relative to specific, important functions of daily life and economy generally. This relationship between the physical geometries of the whole environment in which we live, and the relative value of space and time of our actions, is the true practical meaning of relativity.

So, we have the following picture. The source of increase of the productive powers of labor is, on the one side, the creative power of the individual, especially the productive individual, such as the scientist, the inventor, the true entrepreneurial farmer, manufacturer, and so on. However, the increase of the productive powers of labor is not limited to action at the proverbial "point of production." Improving the basic economic infrastructure can increase the productivity of the individual enterprises within society even without any notable change in the behavior internally generated by those enterprises themselves. To sum up the sundry arguments so implied, the physical geometry of the basic economic infrastructure within which the particular enterprises of a society are contained, is the boundary-condition which determines the general level of productivity which may occur within individual parts of that economy. The development of basic economic infrastructure therefore represents the primary "cost of materials" of any society as a whole. If that cost of infrastructure is not fully paid, the productivity of that economy collapses significantly.



Return to the problem of communication from that vantage point.

In respect to those qualities of the human mind which set the human individual apart from all lower forms of life, the individual human mind is the most sophisticated design-work we encounter. Whenever we attempt to proceed from relatively simplistic explanations of "human nature," we are not merely wrong, but probably dangerously muddleheaded meddlers. The "structure" of the system of relations represented by social processes, is the most scientifically challenging of all of the topics of scientific inquiry we might choose. Plato's dialogues offer us a core of principled insights into those processes. On that matter, the context of this present report permits us to limit ourselves to saying this much of the following about that subject-matter.

The characteristic feature of the individual human mind is what is illustrated by the Platonic principle of hypothesis. That principle of hypothesis, which is the foundation of all Classical artistic composition and physical science alike, is the key to the distinction of man from all lower forms of life, and is, for our knowledge, the principle from which all other characteristics of social processes must be adduced. So, in the known history of human cultures, those aspects of communication which share the attributes of Classical artistic composition, typify the means by which successive generations of populations are able to transmit specifically human forms of knowledge within contemporary society, and across even thousands of years of successive generations.

So, the development and realization of discoveries of physical science, taken together with the aspects of culture which correspond to Classical artistic principles of composition, combine to supply us a higher and broader working definition of physical science. As the history of legend and Classical tragedy attests, from Homer through Schiller and Beethoven, and in the traces of ancient Vedic poetic calendars, these kinds of reflections present us an overview of the subject we might term "Platonic ideas," ideas corresponding to that principle of hypothesis upon which both physical science so-called and Classical artistic composition depend absolutely.

However, all of these elements of knowledge are not sufficient to give us a clear, principled image of the human individual. The crucial word is "immortality." A species may be relatively immortal as a species; but only man is immortal as an individual. The trouble with the word "immortality" begins when we insist upon locating the notion of specifically human immortality axiomatically in the biological individual. The following points are to be considered.

To focus the argument, think about certain great scientific discoveries. Choose discoveries for which we know the original discoverer by name, such as Pythagoras, Plato, Archimedes, Eratosthenes, and so on. We actually know these persons only when we have replicated their relevant act of discovery within our own mind, and when we, in turn, also transmit that inner experience of discovery to others who may come after us. This personification of great discoveries of universal physical principle, is in no sense a fantasy. Think of any experimentally validated universal physical principle. That principle functions as an Herbartian principle, an individuality of the form which Herbart and Riemann reference by the German term *Geistesmasse.* In orderly scientific practice, there is a correspondence between the named (personality) of the discoverer and the quasi-personality of the discovered principle. We must think of the principle as of the form of a personality: It was an object brought into our knowledge by the sovereign cognitive (noëtic) action of a discoverer.

So, the creativity of the individual, both original discoverer and he or she who replicates the act of discovery, is the essential distinction of both man and woman as individuals, and attaches the immortal quality of personality to the discovered principle itself.

Thus, to the degree a person is a consistent reductionist, he or she is virtually dead, or worse, spiritually.

It is this sense of being part of humanity as a whole, a sense accessible to us only through our roles in an ongoing social-noëtic process, which is the proper source of a sane passion for science, or for the creation and performance of Classical forms of artistic composition. It is this sense of the role of science and Classical art which is the only true personal morality of the person. This is what Socrates and the Apostle Paul identify as *agapē,* as that is translated into English as "the common good," or "the general welfare." It is only when we locate our identity so, as opposed to merely those desires which lie within the bounds of our mortal biological existence, that we can be happy in Leibniz's sense of *the pursuit of happiness.*

The cultivation of this sense of the true meaning of happiness, the intention upon which the independence of our republic was founded, is the true, exceptional, virtually unique greatness and exemplary virtue of that republic so constituted under the guiding mind of our Benjamin Franklin, and that of Cotton Mather before him. It is that quality of passion, so infused in our choice of deeds, and our actions themselves, which expresses what Friedrich Schiller defines as *the Sublime,* the quality which a self-doomed Hamlet of Shakespeare's Third Act soliloquy fears, and for fear of which he willfully brings about his own useless death, and that of his nation besides.

The foolish person pursues rewards, or merely avoids penalties. The wise person, of which there are admittedly few in our society today, pursues eternal happiness as Leibniz defined it. That pursuit is his passion, the force which moves him, or her, to discover, and to act for mankind.

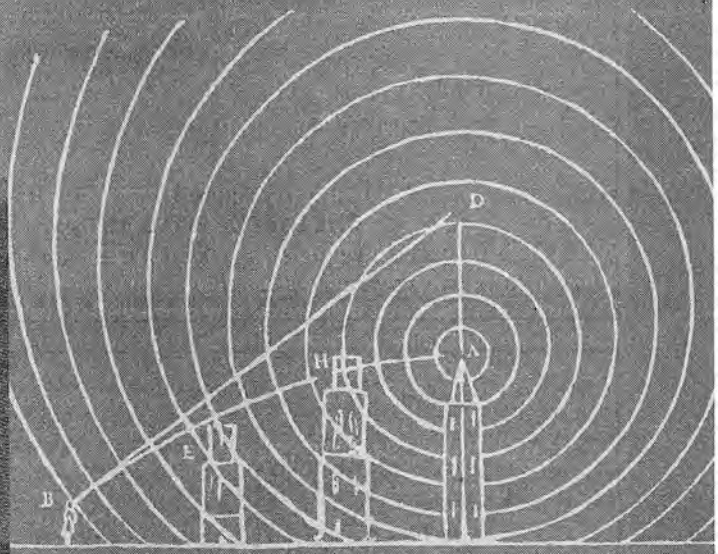
It is the consonance of the Socratic way of thinking, the *Sublime,* with science as Plato implicitly defines science as hypothesizing, and with love for mankind, past, present, and future, which expresses that wonderful passion by which the greatest acts are inspired. There lies the passion for science which is lacking in the reductionist. It is hatred of that which they are not, by the reductionist, which is key to understanding the evil of Newton and of Euler's attacks on Leibniz. If we understand this, we are able to do happily what we must, without regard for fear or favor. Such is, among others, the true scientist.

Economist Lyndon H. LaRouche is a member of the 21st Century *Scientific Advisory Board and a Democratic Presidential candidate in the 2004 election.*

With Huygens, Let There Be Light!

by Pierre Bonnefoy

Library of Congress



The science of light was set back for over a century by Newton's Opticks. *It was not the errors of fact, so much as those of method that had to be remedied.*

Christiaan Huygens (1629-1695)
In the background, Huygens's diagram of the propagation of spherical waves of light from a tower (A) to an observer (B), showing refraction.

The science of optics, which had been making considerable progress in the 17th Century, after Snell's work on refraction, came almost to a halt with the publication of Newton's *Opticks* in 1704. Then in the opening years of the 19th Century, two men—Thomas Young and, most especially, Augustin Fresnel (who was much aided by André-Marie Ampère and François Arago)—revolutionized the theory of light and completely changed the way physicists look at the universe. Yet, between Newton and Fresnel, there is a great gap in the history of science: For one entire century, the science of light stagnated, this in spite of the fact that the experimental *facts* which permitted Fresnel to make his decisive breakthroughs, were amply available to earlier researchers. In fact, diffraction had already been observed in 1665 by Francesco Grimaldi, and double refraction of Iceland spar had been correctly described in 1678 by Christiaan Huygens. Also, Gottfried Leibniz's differential calculus—an indispensable tool for such research—dates from the same period.

How can we explain the relatively scant progress that took place in this domain over the course of the 18th Century? Was it that some "gestation" time was required to digest all the

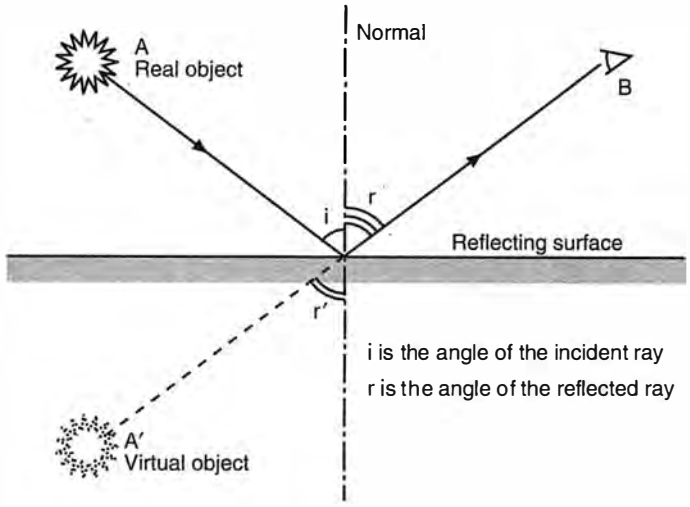


Figure 1
THE LAW OF REFLECTION
The shortest path between A' and B being the straight line, r is thus equal to r'. Now, by symmetry, i is equal to r', and thus i is equal to r.

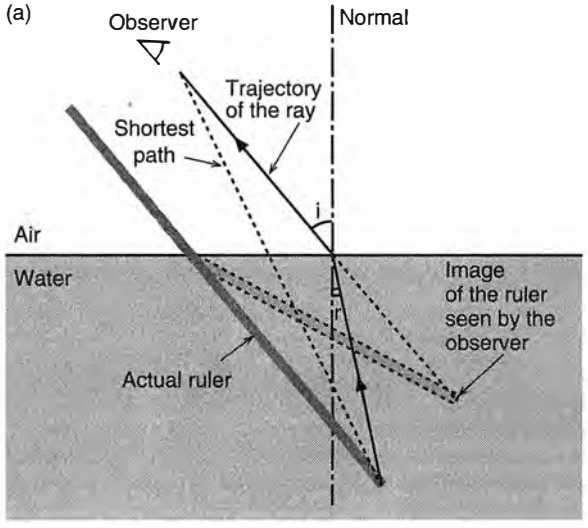
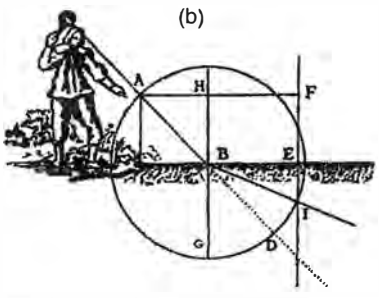


Figure 2
THE PRINCIPLE OF REFRACTION
You can see in (a) that the body of the stick appears to the eye more nearly parallel to the air-water interface, than it is in reality. You can also see that the angle of refraction r is smaller than the angle of incidence i—the opposite of what is shown by the diagram (b) published by Descartes. (Note: This is not drawn to scale.)



preceding discoveries. Or was it rather, that scientific thought itself was at an impasse?

Return to the Law of Sines

We cannot here develop the complete history of the science of light, from the dawn of time to the dark period we have just cited. Fortunately, we have available to us a "generative motif" whose development, much like that of a musical theme in a classical composition, marks the different stages of the history of science of light. The manner in which each scientist develops this "motif" constitutes a sort of condensed image of his vision of science and the universe. This "motif" is the phenomenon of refraction.

• The Greeks considered that a ray of light took *the shortest path* to get from one point to another. Beginning with this principle, they established the law of *reflection,* which stipulates that the angle between the incident ray and the normal to the reflecting surface must be equal to the angle between the reflected ray and that same normal (see Figure 1). But they noticed that such a principle, expressed in that way, could not be universal; in fact, when a ray of light passes from one transparent medium to another, it changes direction. Each of us has had the following experience: When you put a straight ruler into water, it appears to be broken. In Figure 2, the observer "aims" the end of the stick, but because the water is denser than the air, the ray of light gets closer to the normal in the water than in the air: The angle *i* is greater than the angle *r.* If the reader does not commit the same mistake as Descartes, he or she will notice the consequence of this fact—light is refracted more in the water than in the air (and not vice versa!); the stick seems broken "forward."

The principles which govern this refraction, which contradict the principle of *the shortest path,* put forward by the Greeks, was not put in the form of an equation until around 1621 by the Dutch astronomer, Willebrord Snell, in his famous *law of sines.* Unfortunately, we do not know a great deal about Snell's work, nor how he established his formula. However, according to Fermat and Leibniz, Snell was not an empiricist, but undoubtedly must have been seeking a universal principle of nature for generalizing the shortest path principle. Leibniz wrote in his *Discourse on Metaphysics:*

> It seems to me that M. Snellius, who was the first to discover the law of refraction, would have had to wait a long time before finding it, if he had tried to find first how light was formed. But he apparently followed the method the ancients had used for Catroptics, that is to say, the method of final causes.

We will limit ourselves here to giving the geometric expression of refraction. If one considers a ray of light which travels obliquely through a surface separating two different transparent media, the ratio of the sines of the angles of incidence and of refraction are constant, so that the values of

these angles and their ratio depend on the nature of the two media (air, water, glass, and so on). In Figure 3, we have taken as an example two media the ratio of whose sines is 4:3, which is almost the same as the ratio for air and water, and we represent there two incident rays of different obliquity.

We should note, in passing, the limiting case, if the ray travelling through the air is perpendicular to the contact surface, then the ray in the water will be so as well (in this limiting case, the ray of light will not be refracted). If we examine the other extreme case—the case where the ray in the air "grazes" the surface—we will see that a "limit angle" exists, where the ray is unable to pass into the water.

Imagine now, that the ray does not pass from the air to the water, but in reverse, and you will see that the law of sines continues to be applicable. The consequence of this is, importantly, that when the ray in the water goes beyond the limit value as cited above, light will not travel into the air, and will be totally reflected back into the water.

• René Descartes met Snell in 1625, shortly before Snell's death. Some years later, Descartes published the law of sines, which he claimed to have discovered himself, and which is still today called the "law of Descartes" in schools. Nonetheless, Descartes gives "his" discovery such a false and confused explanation, that it becomes clear that he got his "good result" only by plagiarizing Snell.[1]

According to Descartes, in effect, the ray of light which passes from the air to the water, can be compared to a bullet which goes through a piece of fabric. The "shock" of the bullet against the fabric changes the velocity only in the direction perpendicular to the boundary surface (it is odd that Descartes, who considered light as a continuous fluid, would pick such a "corpuscular" image). In order for Descartes's explanation to correspond to the law of sines—that is to say, that the angle between the ray and the normal will be less in the water than in the air—as the experiment shows, the light must be accelerated when it changes from the air into the water, which Descartes postulates *a priori*. However, if you look at the drawing that he provides for illustrating his argument, you will note the exact contrary: His illustration shows the ray further removed from the normal. which contradicts not only the law of sines, but likewise Descartes's (false) postulate, which would have the ray travelling faster in the water because it is closer to the normal.

Descartes seems to have learned the law of Descartes only very superficially, and would certainly have flunked an optics exam!

Leibniz and Fermat denounced this manifest hoax. Fermat wrote in his letters:

> The demonstration of refraction [by Descartes] seems to me a veritable paralogism, first because Descartes founds it on a comparison [but] that the geometry [of his comparison] has nothing to do with his [illustrative figures] . . . secondly, because he supposes that the motion of light in air and in rare bodies is slower than that in water and other bodies, which seems to contradict common sense.

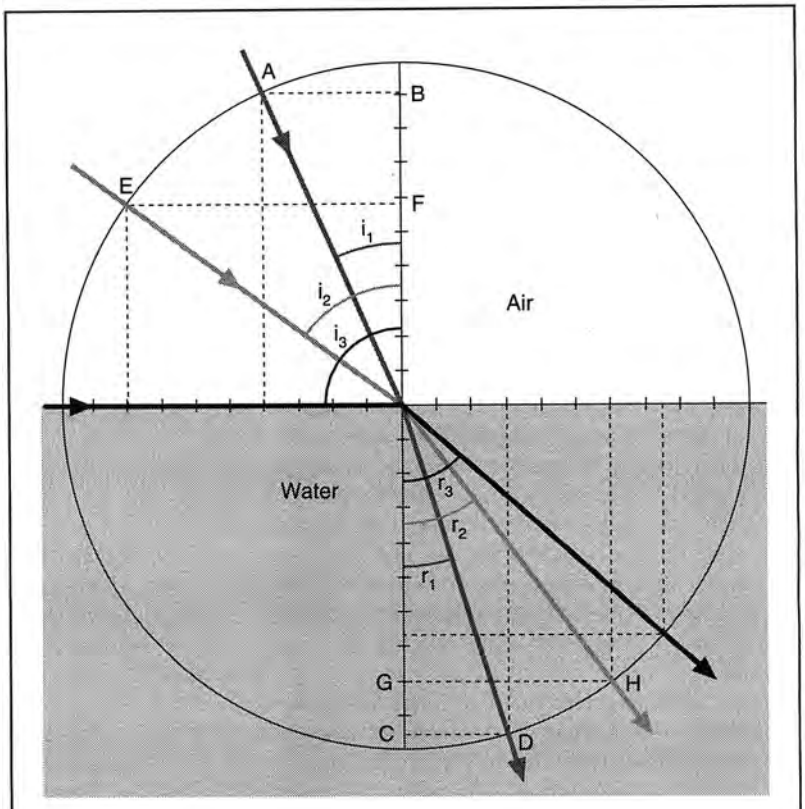


Figure 3
THE LAW OF SINES

The ratio between the sine of the incident angle and the sine of the refracted angle is constant; that is to say, it is independent of the angles of incidence and refraction.

$\sin i_1/\sin r_1 = AB/CD = 4/3$
$\sin i_2/\sin r_2 = EF/GH = 8/6 = 4/3$
$\sin i_3/\sin r_3 = 10/7.5 = 4/3$

We could also mention the fact that one incoherence does not seem to be enough for Descartes, because he supposes here that light changes velocity when it changes media, but elsewhere he affirms that light has an infinite velocity—an affirmation which will be refuted definitively by Rømer in 1676, in spite of the opposition of the Cartesians of his time.[2]

• Contrary to Descartes, Fermat is not trying to find an analogy which might "fit" with the experimental results of the law of sines; he considers the phenomenon of refraction not as a property of light, but the *reflection of a universal characteristic*. If you think back to the shortest path principle of the Greeks, you see that they already had, in germ, Fermat's approach. The principle of the ancients is clearly incomplete,

but the idea which led to it is good: the *search for a universal characteristic.* Fermat then goes on to generalize the principle of the shortest path in such a way as to be able to account for diffraction, and he obtains the *principle of least time.*

To arrive there, he had to first put forward the hypothesis of light's having a finite velocity (even before this was verified experimentally by Ole Rømer), and that this velocity depended upon the medium in which it travels. The principle of the shortest path which leads to the law of reflection, proves to be a special case of Fermat's principle. Steeped in this hypothesis, Fermat succeeds in showing that if you consider two points located in two different media, separated by a common surface, the trajectory of the ray constructed according to the law of sines, is such that the light goes from one point to another in the shortest time. In this way it is possible—even if you do not know the velocity of light in either medium—by measuring the ratio of the sines of the angles of refraction in two media, to deduce the relative velocities in the two media.

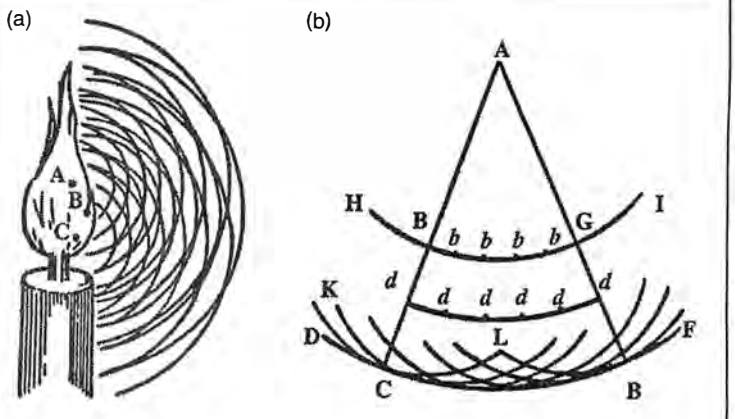


Figure 4
HUYGENS'S WAVEFRONTS
For Huygens, light waves are spherical (a), and every point of space that is illuminated in turn becomes a secondary source of light. In (b), Huygens shows how the principal wave, coming from A, is the geometric envelope of the secondary waves.

It goes without saying that the Cartesians, preoccupied only with finding efficient causes, were most virulently opposed to this idea of a universal characteristic.

• This procedure brought Fermat to the discovery of his method of *maxima-minima* in mathematics, which is a prelude to Leibniz's differential calculus. And it was Leibniz who took the torch from Fermat, to accomplish the next revolution. In 1684, Leibniz published his *Nova Methodus* (New Method), the first work on the differential calculus. In it, Leibniz chooses none other than the law of sines for illustrating the power of his calculus. Given the difference of the velocities of light in different media, and given the principle of least time for light to go from one point to another, Leibniz is able to demonstrate the law of sines mathematically in only a few lines of calculation.

It must be pointed out that Leibniz generalizes to yet another level the universal characteristic established by Fermat: For the principle of least time, Leibniz substitutes the *principle of least action,* which becomes the pillar of his research in every physical domain.

• At the beginning of the 18th Century, two works make reference to the question of light: the *Traite de la lumiere* (Treatise on Light) written by Christiaan Huygens in 1678 and published in 1690, and the *Opticks* of Isaac Newton, published in 1704. The opposition of the concepts underlying these two works—the first presenting the *wave theory* of light, and the second the *particle theory*—is legendary and well known by all of today's physicists.

Well known? Perhaps not as much as we think. Especially if you look at what is said by Michel Blay of the CNRS [French National Center for Scientific Research], a great specialist on the question. In his introduction to the two texts in current editions available in France,[3] here is what Blay writes in a note in the *Traite de la lumiere:*

> Christiaan Huygens, who was a Dutchman, was highly respected in his time and his reputation was no less than that of Newton. One knows that they both studied the nature of light; each developing his own conviction. Newton preached in favor of the corpuscular theory, Huygens, for the wave theory. *The future was to prove them both right* [emphasis added].

Because it is possible to demonstrate both wave and particle phenomena for light, the point of view of most physicists of today is to consider the two antagonistic conceptions of Newton and Huygens as having the same degree of legitimacy. If we admit this comfortable and sterile point of view, however, are we not in danger of bypassing something essential for science? Are we not condemned to repeat a great number of things already known, but never to discover anything?

If we wish to understand why the beginning of the 18th Century marks the beginning of a long period of stagnation in the science of light, we must first examine more closely the writings of Huygens and of Newton, beginning with the one published first.

The *Treatise on Light*

A reading of the work of Huygens might seem to contradict what we presented above. In effect, according to our immediate intuition, light seems to be composed of a multitude of luminous *rays.* For that matter, the constructions which are used to represent the phenomenon of refraction, certainly show us how a rectilinear ray changes direction when it changes medium. That the whole world uses the notion of ray when speaking of light, is so obvious that it hardly needs mentioning. However, although Huygens does use the notion of a ray in the *Traite de la lumiere,* he does so in a somewhat unusual way. For him, the wave "precedes" the ray: The ray is a complicated phenomenon which is the result of a certain

combination of ondulatory phenomena, but it is not a *simple element!* It is just a convenient way for describing certain phenomena. In the same way, to use Leibniz's image, we say that the Sun rises every morning, although we know perfectly well that properly speaking it does not rise, but that it is the Earth that turns.

Thus, for Huygens, the point of departure of his construction is the wave, and a spherical wave, no less, in first approximation. It must be imagined that light behaves somewhat like the wave formed on the surface of water. Each of us has observed circles of concentric wavelets which spread outward and increase in size when an object falls into the water. True, there is a circular perturbation which moves along the surface, away from the center, but there is no displacement of "matter": If an object is found in the path of the wave, it is momentarily lifted up, but it does not move along with the perturbation, which is moving away from the center.

Huygens thinks that the light wave is formed in the same manner, not in the plane but in space as a whole. For that matter, there is no unique source of light (such as a point, or an object falling in the water) but there is an infinity of light sources. . . . In fact, every point of space which is illuminated, in its turn, becomes a source of secondary light around which new spherical waves will develop (Figure 4). Under these conditions, it is clear that at every instant, every point of space finds itself at the juncture of an infinity of waves, all originating from all the other points of space. Properly understood, as in water waves, it has crests and troughs, but the contributions of secondary waves will not necessarily produce the same effect at any one point in space. Rather, they will perturb one another reciprocally—which is why there is not an infinite illumination at each point in space.

However, you can see in Figure 4(b) how on the circle *DCBF,* the principal wave coming from *A,* adds itself to the secondary waves coming from points *b* and points *c,* in such a way that here the principal wave is the geometric envelope of all the secondary waves. This envelope is thus a "wave front," and the latter, in its turn, will generate its own secondary waves over the course of its development. Now, if you were to isolate in thought an image of a radial line coming from an initiating source, the result would be a ray or sorts, but this ray would not be something simple, but the result of a process.

Now let us look at the way in which Huygens, with that underlying conception, treats the question of refraction. By hypothesis, the nature of light is wave-like, and the velocity of this wave depends upon the medium in which it is to be found. Let us note in passing that *Huygens does not make an a priori hypothesis that claims to know if the velocity of light is greater or less in more or less dense media.* He simply supposes that this velocity changes when the medium changes.

In the example shown in Figure 5, let us suppose that the velocity of light in the first medium is greater than in the second, and we will see that that brings with it the ratio of sines. The reader is invited to reproduce for himself this figure with a ruler and a compass, choosing the ratio of the speeds which he wishes (for example, 4/3 or 3/2).

In Figure 5, the principal source of light is a great distance away, considered to be essentially infinite. In this case, as the circumference of a sphere of infinite radius, the wavefront is considered to be a plane. This is represented seen "from the side," which gives us the straight line *AC,* point *A* being the point of intersection between the wavefront and the boundary surface between the media. The straight line *DA* can be considered as an incident ray which comes from the first medium and enters the second medium at point *A.*

You can see that as the wavefront penetrates the second medium, the segments *KL* represent the parts of the front that are still within the first medium. The straight lines *AG, HM,* and *CB* represent the paths which would have been taken by the rays if there had not been a change of medium: The front which was to be found initially in *AHC* would have then ended up at *GMB.*

But what becomes of the ray *DA* in the second medium? Light passes from point *A* to a certain point *N,* which is to be determined. What is the distance between *A* and *N?* You know that in the same time period, light passes from *A* to *N* and from

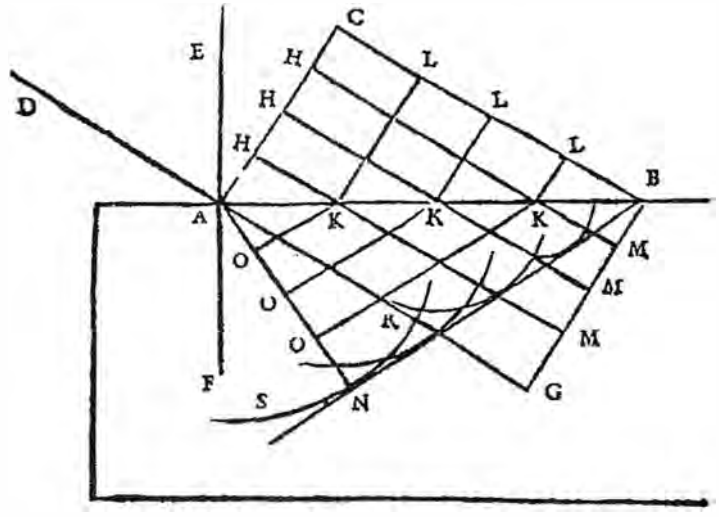


Figure 5
HUYGENS'S WAVEFRONTS EXPLAIN THE LAW OF SINES
DA is an incident ray, which comes from the first medium and enters the second medium at A. The segments KL represent the parts of the wavefront that are still in the first medium. At each point of contact K between the two media, you can draw a circle in the second medium whose radius is determined by the ratio of the velocity of light in the two media. These circles will have a common tangent, NB. The angle of the common tangent with the surface (ABN) will be equal to the refracted angle (FAN). The sine of this angle will be in the same ratio to the sine of the angle of incidence as the velocities in the two media.

After a portrait by Tardieu, Frontispiece from Vol. II of Fresnel's works

Augustin Fresnel
(1788-1827)

Willebrord Snell
(1580-1626)

Gottfried Wilhelm Leibniz
(1646-1716)

C to *B*, and you know the ratio of the velocities between the two media: If this ratio is 3/2, then the ratio of *CB* to *AN* will be of 3 to 2. Now, because by construction you know the distance *CB*, you can deduce the distance *AN*, which must thus be equal to two thirds of *CB*.

Knowing this distance *AN*, you can then draw a circle whose radius is this distance and whose center is *A*. You know, therefore, that point *N* is on the circle and that it is in the second medium, but its exact position is still to be determined.

Let us begin again using the same reasoning for a point *H* intermediate between *A* and *C*. At the end of a certain time, the front *HC* will be translated to *KL*, *K* being a point of contact with the second medium. During the remaining time, light will pass from *L* to *B* in the first medium, while it travels a certain distance beyond the point *K* in the second medium—a distance which we can determine as we did before for *AN*, by using the ratio of the velocities. You can see that for each point of contact *K* between the two media, you can draw a circle in the second medium; and you can draw as many circles as you wish.

Now, all these circles have a common tangent which can be constructed: the straight line *NB* which is none other than the new position of the wavefront, which was earlier at *AC*. The intersection of this straight line with the circle centered in *A*, of which it is the tangent, will give us the point *N*. In fact, the figure shows different stages of the evolution of a wavefront. It remains to determine the direction of the straight line *AN*, to see if the law of sines is verified by this construction.

Thus, we must calculate the ratio of the sines of the angles *DAE* and *NAF* and to make sure that it is constant; that is to say, that it does not depend upon the angle of incidence. To do this, let us consider *AB* to be the radius of a unit circle. *AB* is also the hypotenuse of two right-angled triangles: *ACB* (because the wavefront is perpendicular to the ray) and *ANB* (because *BN* is tangent to the circle of radius *AN*). From this we see that the sine of the angle *BAC* is *BC* and the sine of the angle *ABN* is *AN*. Now, the angle *BAC* is equal to *DAE*, because each of them added to *CAE* forms a right angle. Similarly, *ABN* is equal to *NAF* because each of them added to *BAN* forms a right angle.

The ratio of the sines of the angles *DAE* and *NAF* is thus equal to the ratio of *BC* to *AN*. By construction, we can establish that this last ratio is equal to the ratio of the velocities of light in the two media (a ratio evidently independent of the angle of incidence). Thus by using Huygens's wave hypothesis as a basis, we have found the law of sines.

One consequence of this construction jumps out at you right away: If, as in our construction, the second medium slows the light down more than does the first medium, then the refracted ray will have a smaller angle with the normal than did the incident ray. Whence also the reverse: Because in water or in glass, the refracted ray is closer to the normal than the incident ray in the air, you can conclude from this that the velocity of light in air is greater than in these two media. Huygens thus takes the side of Fermat against Descartes. To render homage to Fermat's approach, Huygens use a calculation shorter than his predecessor's, to show that his construction respects the principle of least time.

Before going on to examine Newton's hypothesis, we propose that our reader make Huygens's construction for himself for the case we have just developed, except that the velocity in the second medium is to be greater than in the first, and to rediscover the law of sines in the process. But, you will have to be careful not to fall into a little trap.

The *Opticks*

The difference between the optics of Huygens and of Newton is crystal clear. For Newton, the luminous ray is of primordial importance: It is made up of a sequence of luminous particles, very small and very fast (but of finite velocity) when the trajectory is a *straight line*. This straight line deviates when the particles encounter an obstacle, such as, for example, the

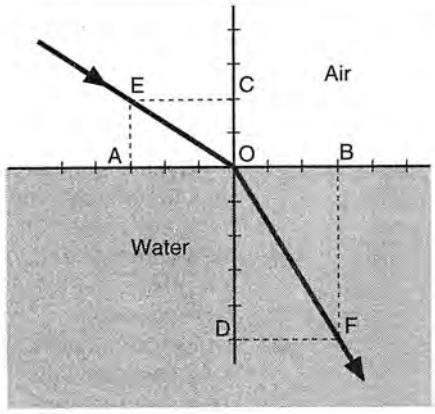


Figure 6
REFRACTION, ACCORDING TO NEWTON (AND DESCARTES)
In the view of Newton (and Descartes), the light is accelerated in a direction normal to the boundary surface: If one represents the horizontal component of the velocity AO and OB for two equal lines, the vertical components CO and OD will be such that OD is greater than CO. (Note: the drawing is not to scale.)

surface which delimits two transparent media with different indices of refraction. Newton expounds very clearly his hypothesis at question XXIX:

> Are not the Rays of Light very small Bodies emitted from shining Substances? For such Bodies will pass through uniform Mediums in right Lines without bending into the Shadow, which is the Nature of the Rays of Light. . . . Pellucid Substances act upon the Rays of Light at a distance in refracting, reflecting, and inflecting them, and the Rays mutually agitate the Parts of these Substances at a distance for heating them; and this Action and Re-action at a distance very much resembles an attractive Force between Bodies. If Refraction be perform'd by Attraction of the Rays, the Sines of Incidence must be to the Sines of Refraction in a given Proportion, as we shew'd in our Principles of Philosophy: And this Rule is true by Experience. The Rays of Light in going out of Glass into a *Vacuum,* are bent towards the Glass; and if they fall too obliquely on the *Vacuum,* they are bent backwards into the Glass, and totally reflected; and this Reflexion cannot be ascribed to the Resistance of an absolute *Vacuum,* but must be caused by the Power of the Glass attracting the Rays at their going out of it into the *Vacuum,* and bringing them back. . . .

In sum, for Newton, light goes back to a principle of universal gravitation applied to luminous particles.

The greater part of the *Opticks* is a description of Newton's experiments on the decomposition of light, which he explains by showing that the rays of different colors are not refracted equally when they traverse a transparent prism. Here again, the phenomenon of refraction plays a crucial role and thus we ought to examine the manner in which Newton finds the law of sines. Newton proceeds in a way that recalls the "reasoning" of Descartes, with this difference, that he gives a mathematical demonstration and a coherent diagram. As we said above, Newton's entire development rests upon the theory of universal gravitation applied to luminous particles: The more dense the medium, the more force will be exercised upon the luminous corpuscles. Thus, when light passes from the air into glass or into water, he sees the speed strongly accelerated in a very small space, which corresponds to the "thickness" of the boundary between the two media. Moreover, this "acceleration" is perpendicular to the boundary between the two media. Like Descartes, Newton decomposes the velocity of light into two orthogonal components: One is normal to the point of contact, the other perpendicular to that.

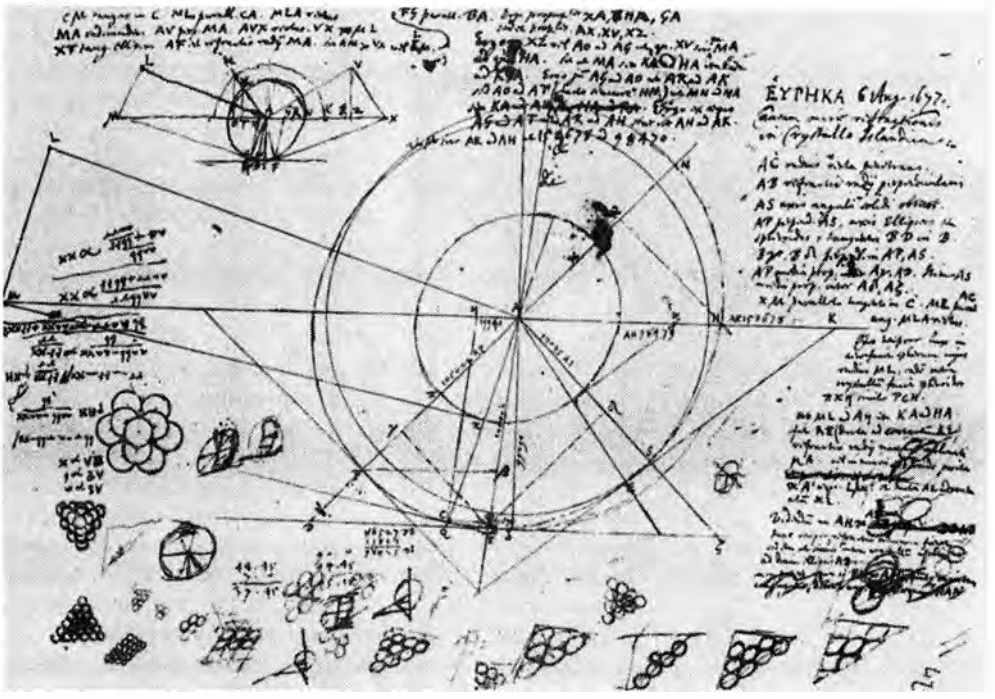
Figure 6 shows a ray passing from the air into water (proportions not to scale). According to what was said above, the component of velocity that is parallel to the surface remains unchanged: this component which is represented by AO for air, is thus equal to the component OB for water. On the other hand, the component perpendicular to the surface is increased; that is to say, that *OD* for water is greater than *CO* for the air. This means that the resultant velocity in the water (*OF*) is greater than the resultant velocity in the air (*EO*). Thus light travels faster in a more dense material (water, glass) than in the less dense (air).

Then how did Newton come to establish the law of sines? He did it by using the mathematical law which allowed him to calculate the increase of the normal velocity component; in other words, the ratio which allows for *OD* to be determined upon the basis of *CO*. That being done, Newton can calculate the ratio between the sines of the angle of incidence and refraction, and prove that this ratio is constant when the angles vary—which was to be demonstrated, and which Newton actually does demonstrate.

There is no need here to go into the details of the calculation, but it is important to see how he establishes the ratio which allows him to calculate the increase of the normal component of the velocity. Let us follow Newton (*Opticks,* Prop. VI, Theor. V.):

> If any Motion or moving thing whatsoever be incident with any Velocity on any broad and thin space terminated on both sides by two parallel Planes, and in its Passage through that space be urged perpendicularly towards the farther Plane by any force which at given distances from the Plane is of given Quantities; the perpendicular velocity of that Motion or Thing, at its emerging out of that space, shall be always equal to the square Root of the sum of the square of the perpendicular velocity of that Motion or Thing at its Incidence on that space; and of the square of the perpendicular velocity which that Motion or thing would have at its Emergence, if at its Incidence its perpendicular velocity was infinitely little.

For any chosen angle of incidence, let us call it V_1 the perpendicular velocity of light in the air, and V_2 the perpendicular velocity in the water. Newton here introduces a limit case, where the ray in the air "grazes" the surface of the water, that is to say, when the perpendicular velocity of light is consid-



Huygens's diagram explaining the double refraction in Iceland spar, using his concept of spherical waves.

ered to be zero. We know that the perpendicular velocity of the light in the water is not zero, when the ray is refracted by the water and forms a limit angle with the normal; let us call this V_0.

Newton thus says that $V_2^2 = V_1^2 + V_0^2$.

Does that remind you of anything? It is identical to the formula which can be used to express the rate of change of velocity for a body in free fall. Newton develops his optics based on an algebraic analogy with the way he sees mechanics: Light for him is corpuscular.

A Moment of Tension

Having arrived at this point in our short history, we should pause and reflect for a moment. We are at the beginning of the 18th Century; science goes into stagnation. Two contradictory hypotheses of light confront each other. What judgment can we bring to bear on this situation? How can we discover the truth. If we believe that we already know the "right answer," then we really have a problem, for this illusion prevents genuine thought.

We do know that the science of the 18th Century was dominated by the conceptions of Newton. We know that in France, the science of light was plunged into darkness by the Enlightenment, beginning with the biggest liar of them all, Voltaire, who showed himself to be an enthusiastic propaganda agent for Newtonianism in his *Philosophical Letters,* not to mention Buffon, who translated Newton's method of fluxions and infinite series into French..

It took another century for a young man to appear, Augustin Fresnel, who would have the courage to say—and prove—that the emperor Newton did not have on any clothes. Fresnel launched a series of attacks on Newton (see his *Oeuvres completes* [Complete Works]), whose virulence is quite unusual in the whole of the history of science. For example, Fresnel wrote:

> Huygens, guided by a thoughtful hypothesis in wave theory, recognized the first of the true laws of double refraction of crystals with one axis. This discovery was perhaps more difficult than all the discoveries of Newton on light, and seems to prove that here, Newton, after useless efforts to find the truth, fell into error. When we imagine how much the phenomenon of double refraction must have pricked his curiosity, we cannot suppose that he gave it less attention than other optical phenomena, and we might be surprised to find him substituting a false rule for the construction so exact and elegant as Huygens's, which he undoubtedly knew, because he cites the *Treatise on Light*. But what seems even more inconceivable, is that the validity of Huygens's law has been unknown for more than 100 years, in spite of the experimental verification provided by this great man, as remarkable perhaps for his sincerity and his modesty as well as his rare sagacity. If we were to hazard an explanation for this singular fact in the history of science, we would say that the partisans of the particle emission theory had thought that the wave theory which had guided Huygens, could not have brought him to truth, and this prevented them from reading his *Treatise on Light* with the attention which it merited.

Fresnel thus says that Newton, although well aware of the more advanced conceptions of Huygens, publishes and imposes his own more primitive ones. Today, we are capable of measuring the speed of light in different media, and we know that light is faster in air than in water or glass. Thus we know that on this question Huygens had "the right answer," and that Newton's demonstration of the law of sines is no more than a useless mathematical construct. But is it really in this way that we should search for the truth?

Here we are speaking of things we learned, but did not discover for ourselves. Fresnel did not have our measuring apparatus. Where, then, did he find the courage to dare to say "no" to the accepted science of his time, and undertake long stud-

ies of his own. It is not self-evident to see in light, as Huygens did, anything other than rays. How was it so evident to him that light's velocity was less in more "dense" media? Let us relinquish our intellectual comfort and "forget" what we have learned about the velocity of light, and let us try to place ourselves mentally in the period of Huygens and Newton. With what kind of authority could we say that the one was right, rather than the other?


Painting by Franz Hals

René Descartes
(1596-1650)

Isaac Newton
(1642-1727)

The Question of Hypothesis

We said above that the whole debate about the question of light is seen in a extremely reductionist manner, by our contemporaries. We hear it said regularly that Newton took the corpuscle as his *basic element,* and Huygens, the wave. Today, quantum physics has found no reason to favor one or the other, the corpuscular or the ondulatory. We are allegedly dealing with two different *objects*—the wave and the corpuscle—which are allegedly equally legitimate.

However, in reasoning of this kind, we fall into the trap of the old and new Newtonian. The essential difference between the two thoughts which we are examining, does not consist of what is chosen as a basic element, but a *method* of thinking. In effect, it is possible to make a Newtonian "wave theory," which considers that the light exists within a *perfectly homogeneous* medium which occupies the whole universe, and which supports the waves that make up light. Now, in the correspondence between Leibniz and Clarke (where Clarke is the official spokesman for Newton, and Leibniz inherits the scientific tradition of his teacher and friend, Huygens), Leibniz reproaches Newton for thinking that there exist in nature two objects that are perfectly identical. Here is what Leibniz says in his fifth letter to Clarke, Section 21, regarding this principle of *sufficient reason* (nothing happens in the universe without sufficient reason):

> It must be confessed that, though this great principle has been acknowledged, yet it has not been sufficiently made use of. . . . I infer from that principle, among other consequences, that there are not in nature two real, absolute beings, indiscernible from each other, because if there were, God and nature would act without reason in ordering the one otherwise than the other, and that therefore God does not produce two pieces of matter perfectly equal and alike. . . . This supposition of two indiscernibles, such as two pieces of matter perfectly alike, seems indeed to be possible in abstract terms, but it is not consistent with the order of things, nor with the divine wisdom by which nothing is admitted without reason. The vulgar fancy such things because they content themselves with incomplete notions. And this is one of the faults of the atomists.[4]

In other words, if two identical bodies were to exist, the order of the universe would remain the same if these two bodies were changed. Hence there would be no reason for the two bodies to continue in one state, rather than in another. As a result, something would exist in the universe without a reason, which violates the principle of sufficient reason.

From this standpoint, you can see that the very idea of an atom as a *basic building block,* is impossible (a corollary of this is that likewise a *homogeneous* medium is impossible, otherwise it would be possible to conceive of two identical objects, by thinking about two parts which have the same dimensions.) Thus, for Leibniz as for Huygens, all objects which are accessible to our senses (rays, waves, corpuscles, and so on) must be conceived of as *singularities* of processes. In fact, if it is not possible to derive anything from a combination of basic building blocks or fixed objects, the only thing which might be considered as constant in our universe, is *change.* And since there exists only one universe, this change is nothing other than *permanent action of the universe on itself.*

That brings us to the fundamental question for all scientific research: How can we know this change? Only through the method of *hypothesis.* Now we should go back to a point whose importance is generally neglected and not well understood. In all his writings, Newton repeats with a remarkable insistence, that he never makes hypotheses on the causes of phenomena, but contents himself with describing experimental facts. His *Opticks* begins with the following words:

> My Design in this Book is not to explain the Properties of Light by Hypotheses, but to propose and

prove them by Reason and experiments: In order to which I shall premise the following Definitions and Axioms. . . .

And his work is an attack against the wave hypothesis of Huygens. Newton is allegedly content with the passive and *objective* observation of phenomena such as rays, and to deduce from such phenomena the mathematical laws, starting with things that have already been proved, or are *self-evident*.[5]

It is just this notion of self-evidence which ought to be suspect to us. As we have seen above, Newton is lying when he pretends not to make hypotheses. In effect, his "experimental view" is not "objective" (nothing could be that), but it is already "pre-formed" by his *false* hypothesis—that light is made up of basic corpuscular elements.

Under these conditions, how do we find the cause of observed phenomena? How can we find these processes which govern nature and which are not accessible to the senses alone? How can we avoid being fooled by false hypotheses?

Causality and the Principle of Least Action

To give an image which characterizes the difference between the way of thinking associated with the tradition of Fermat, Huygens, Leibniz, and Fresnel on the one hand, and the tradition of Descartes, Newton, and Laplace on the other, let us consider the following. Let us imagine an endless alignment of dominoes set up vertically next to one another and the "wave" which moves along this array in the process of each domino falling upon the next one. What is the cause? In the universe of efficient causes, of Descartes and Newton, the cause of the fall of domino *N* is domino *N–1*, domino *N–1* falls because of domino *N–2*, domino *N–2* falls. . . . We'd better stop there before we fail to find the "prime mover."

Radically different is the following reasoning: *Why were these dominoes arranged in such a way?* There we get out of the world of the domino's immediate neighbor, and to try to understand the ensemble we look for a higher cause in the Universe, higher than arrangement of the dominoes. In brief, we look for a *universal principle*.

The history of the science of light has given us a brilliant example of such research, which we have cited above; that is, the action of moving from the *principle of the shortest path, to the principle of least time, to the principle of least action.* Each of these hypotheses is quite evidently subsumed by the following one, and must be considered as such, and not an object in itself. We are not trying to find something interesting in the laws of optics, but rather a universal principle which will permit us to find new laws of optics. This is also what Lyndon LaRouche calls *the hypothesis of the higher hypothesis.*

Let us now come back to the law of sines. Now it is easier to understand the rage which welled up in Descartes at Fermat's simple idea that a universal principle might exist. For Descartes, nature is "blind": A ray of light in a homogeneous medium will follow its "natural" trajectory, the straight line.

Thus the ray follows a rectilinear trajectory up to the moment that an "accident" occurs, the ray meets the boundary of the two transparent media in *O*—Figure 7(a). The shock changes the orientation of the ray, which continues on its blind course in the new medium in a new direction; that is, a new straight line until the next accident. There is thus but one point of space-time to take into consideration: the point of impact.

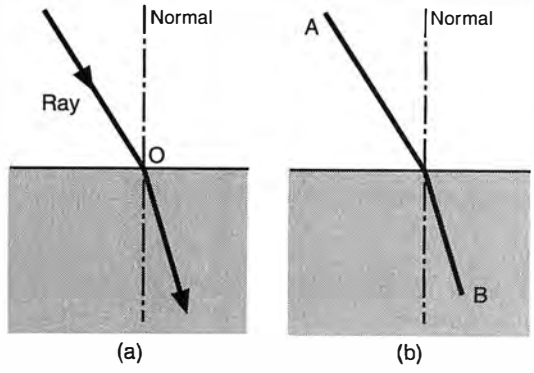


Figure 7
NEWTON AND DESCARTES VS. FERMAT ON REFRACTION

In the Cartesian-Newtonian view (left), it is the point O which determines the effect (refraction). In Fermat's view (right), to go from A to B, the ray takes the path of least time: It is the Universe which determines the local effect.

The question which Fermat poses is different. If we considers two points *A* and *B*—Figure 7(b)—in two different transparent and contiguous media, what is the path which permits minimizing the time which light takes to go from *A* to *B? Here, it is no longer the point of impact which dominates, but the space-time of the whole.*

For Descartes (and Newton), the universe in its totality is the algebraic sum of local elementary objects and forces. For Fermat (and Leibniz), on the contrary, each local event is the result of an *action of the totality of the universe on itself.* Are we disturbed by this? Perhaps we might ask about the moment that the ray begins its departure from point *A: How could it "know"* which path to take to get to *B* in the shortest time? Would there be something more rapid than light which goes before the ray and shows it the way?

Let us for an instant put this troubling question between parentheses. We have to question ourselves more in depth about our manner of thinking about science and the universe. What is a physical law? What is a universal principle? We have studied the law of refraction, we have been able to come up with that law, to say that the ratio of the sines of the angles of incidence and refraction is constant, and equal to the ratio between the velocities of light in the different media which it is traversing. Now we can make a table and put down a list of the velocity of light for all the media that we wish. However, a description of a physical phenomenon by a mathematical formula is not a physical explanation of the

phenomenon. This is proven by the fact that although they used the same formula, the law of sines, Huygens and Newton gave two contradictory descriptions of the velocity of light.

Newton's point of view is that we must be satisfied with describing phenomena without looking for their causes. (The underlying message of this process is openly anti-scientific, because it does not want to know "why.")

In reality, mathematics is a useful tool allowing us to describe, with many limitations, discoveries effected *in the physical world.* However, these physical laws, these discoveries of new physical laws, are themselves phenomena which *exist in the physical world,* whence they are phenomena which obey certain laws, because we have admitted that nothing happens in this universe without a cause.

We see here the irony and ambiguity of the notion of "physical laws" itself. We said above that one of the characteristics of the universe is that it acts on itself, and transforms itself continuously. How, in this case, is it possible to speak about a physical law—which is by definition constant—for describing this universe? How can such a fixed object account for motion? There is a paradox!

Leibniz was perfectly aware of this paradox, which is why he puts everything that has been held to be self-evident into question. And that is why, and rightly so, he was searching for a way to take into account the permanent self-transformation of the universe; whence his search for a *universal characteristic.* It is clear that such could never be achieved if the enunciation of such a law already laid down its limitations. It is equally clear that in proceeding in that way, Leibniz creates the social environment which *favors the new scientific discoveries,* not so much by enunciating truths, but by driving out prejudices and *making people conscious of the way they are thinking!*

When scientists go along with Newton's obsessive fixation about objects (atoms, the void, time, absolute space, universal constants, and so on)—something which the scientists have done to themselves, and continue to do, this leads them to dead ends, as we have shown sufficiently above.

Let us now go back to the troubling thought we had above about light utilizing the shortest time. Whether we like it or not, this is a *physical reality.* The metaphysics of Descartes and Newton denied the possibility that a universal principle might exist. Their calculations *deny a fact* for which we have the experimental proof today: to go from *A* to *B,* light takes the shortest time possible. That fact is generally presented in school as a mere curiosity or, at best, as a means of calculation, but it exists nonetheless. We must be aware that we will not arrive at an explanation in the simple framework of optics.

We have asked ourselves how light might know *a priori,* what path it should take. This trouble comes to us from the fact that implicitly we hold time to be a fixed, given, absolute. Now, let us say it again: We have seen that the universe acts continuously upon itself. Let us add to that, that time has itself a physical existence in this universe. If time is not a primordial "given," if we get to the point that we understand that action ontologically "precedes" time, is there anything that remains shocking about the principle of least action? Why should the action of the universe on itself, by which the universe obtains a certain result, be the least of all the possible actions that would achieve the same result? We can answer this question by a *reductio ad absurdum:* If the universe used more force than needed for realizing some work, that would mean, as Leibniz has shown, that there would be something which violated the principle of sufficient reason. In effect, a portion of the force which the universe mobilized would have been *useless,* for no reason.

The problem posed here for Newton and Descartes, is that sufficient reason, which we are investigating, exists in the universe considered in its totality—that is to say, in all of *physical space-time.* For someone who thinks that time is something absolute, it will not be possible to investigate the reason for things, except in the *past.* The irony here is that Leibniz *researches causes in the future!* It is just these paradoxes launched by Leibniz, such as his rejection of absolute time, which permitted Gauss and Riemann to realize their major breakthroughs in the 19th Century, one of whose by-products is the advanced technology of the following century. What finally makes Fermat, Huygens, and Leibniz right against Descartes and Newton, is not so much their results (in the sense that people usually think about results) but rather their *method.* Their heritage is a world in which more and more discoveries have become possible than in the world in which they were born. A more open world. Let us, too, begin to reconsider the way we have been thinking.

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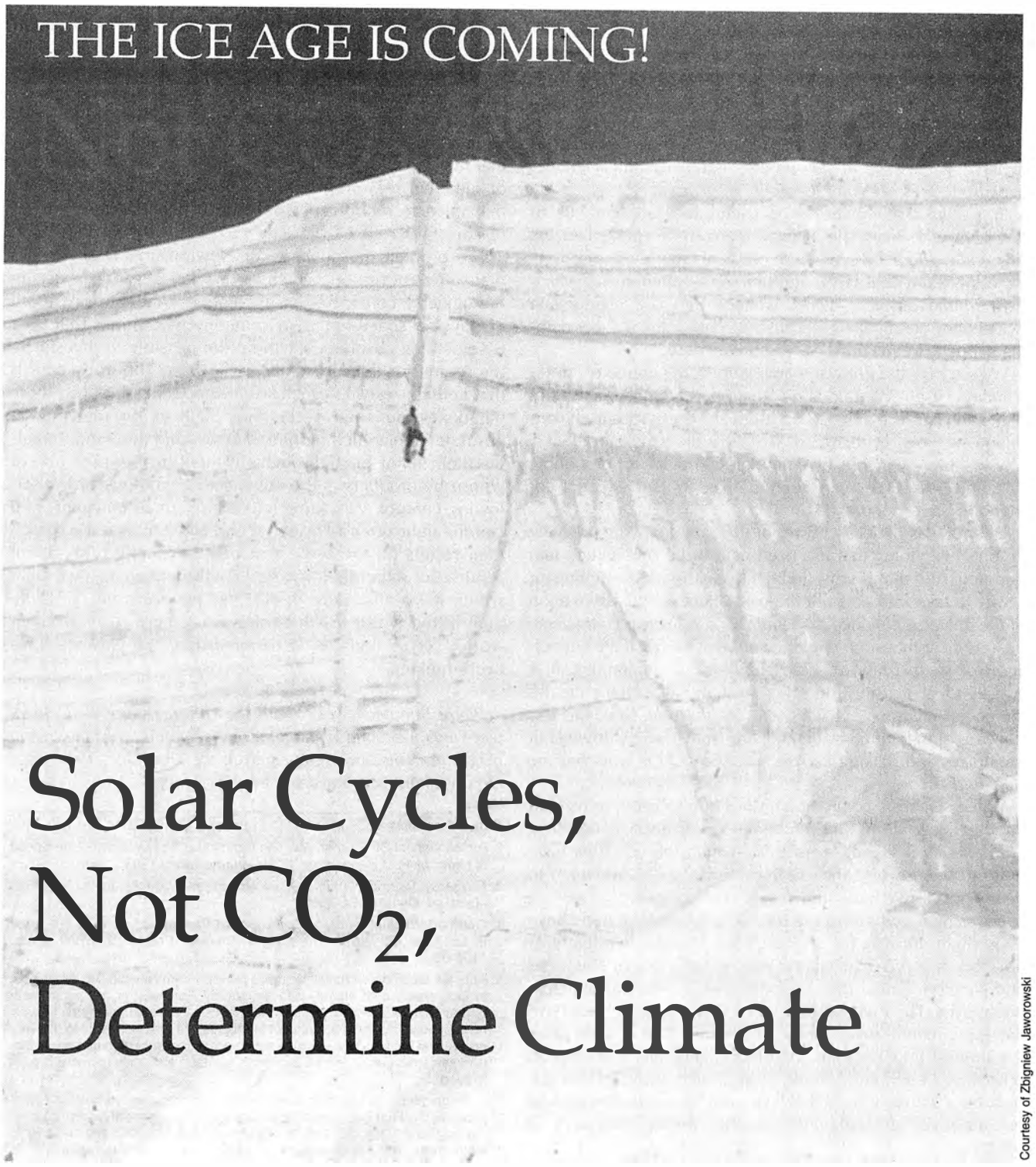
Notes

1. See *Fusion,* No. 65.
2. For the story of Ole Rømer, see "Ole Rømer and the Discovery of the Speed of Light," by Poul Rasmussen, *21st Century,* Spring 1993, p. 40.
3. Huygens, *Traite de la lumiere,* ed. Dunod; and *Opticks,* trans. Jean-Paul Marat, ed. Christian Bourgois.
4. Gottfried Wilhelm Leibniz, *Philosophical Papers and Letters,* ed. Leroy E. Loemker, (Chicago: University of Chicago Press, 1956) Vol. 2, pp. 1138-39.
5. Here we touch on a crucial prejudice deriving from Newton. His thought is, in fact, *linear,* both literally and figuratively. For Newton, the most "self-evident" axiom is the straight line; that is, of all possible geometric figures, he supposes it is the least subject to change. He thus brings us to the very opposite of the idea of a universe which possesses a certain *curvature;* that is to say, which *acts,* with lasting result, on itself. Newton's universe is really dead.

   To demonstrate that this is not simply a problem in Newton's *Opticks,* consider the First Law, which he places at the beginning of his *Principia,* in the section on "Axioms, or Laws of Motion," the first "fact" which students learn on the first day of classroom physics: "Every body perseveres in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impressed thereon."

   This principle of inertia implicitly requires us to accept many assumptions as self-evident. Among others, one must accept that the space of the real universe can be mapped into a Cartesian grid, infinitely extended in three dimensions, and independent of the existence of all matter. One must also imagine that it would be possible to place a unique body in such an empty space! Leibniz had already rigorously refuted such notions, but we had to wait for Riemann, and all the developments of physics after him, before one dared to say that the principle of inertia is nothing but a hypothesis—yet it is a hypothesis which we continue to inculcate into students of physics as if it were an eternal truth!



Solar Cycles, Not CO_2, Determine Climate

Courtesy of Zbigniew Jaworowski

by Zbigniew Jaworowski, M.D., Ph.D., D.Sc.

The author's colleague, K. Cielecki, excavating an ice sample from a shaft in the middle of an ice cliff at Jatunjampa Glacier in the Peruvian Andes. The black lines reflect a summer deposition of dust on top of particular annual ice layers. The black layer near the top of Cielecki's head was formed after the 1963 eruption of volcano Gunung Agung in Bali, Indonesia, causing the highest volcanic dust veil in the atmosphere since 1895. Some of the other black lines reflect local eruptions.

Get out the fur coats, because global cooling is coming! A world-renowned atmospheric scientist and mountaineer, who has excavated ice out of 17 glaciers on 6 continents in his 50-year career, tells how we know.

Since the 1980s, many climatologists have claimed that human activity has caused the near-surface air temperature to rise faster and higher than ever before in history. Industrial carbon dioxide emissions, they say, will soon result in a runaway global warming, with disastrous consequences for the biosphere. By 2100, they claim, the atmospheric carbon dioxide concentration will double, causing the average temperature on Earth to increase by 1.9°C to 5.2°C, and in the polar region by more than 12°C.

Just a few years earlier, these very same climatologists had professed that industrial pollution would bring about a new Ice Age. In 1971, the spiritual leader of the global warming prophets, Dr. Stephen H. Schneider from the National Center for Atmospheric Research in Boulder, Colorado, claimed that this pollution would soon *reduce* the global temperature by 3.5°C.[1] His remarks were followed by more official statements from the National Science Board of the U.S. National Science Foundation, ". . .[T]he the present time of high temperatures should be drawing to an end . . . leading into the next glacial age." In 1974, the board observed, "During the last 20 to 30 years, world temperature has fallen, irregularly at first but more sharply over the last decade."[2]

Courtesy of *Polityka* magazine

The Polish-language weekly Polityka *featured a shorter version of this article as a cover story, July 12, 2003.*

No matter what happens, catastrophic warming or catastrophic cooling, somehow the blame always falls upon "sinful" human beings and their civilization—which is allegedly hostile and alien to the planet.

In 1989, Stephen Schneider advised: "To capture the public imagination . . . we have to . . . make simplified dramatic statements, and little mention of any doubts one might have. . . . Each of us has to decide the right balance between being effective and being honest."[3] This turned out to be an "effective" policy: Since 1997, each of approximately 2,000 American climate scientists (only 60 of them with Ph.D. degrees) received an average of $1 million annually for research;[4, 5] on a world scale, the annual budget for climate research runs to $5 billion.[6] It is interesting that in the United States, most of this money goes toward discovering the change of global climate and its causes, while Europeans apparently believe that man-made warming is already on, and spend money mostly on studying the effects of warming.

Governments of many countries (but not the United States, Australia, or Russia) signed the infamous Kyoto Protocol, which is aimed at the mandatory reduction of oil, coal, and gas combustion. Should this convention be universally implemented, the drop in world temperature would be hardly perceptible, but there would be a drastic and very noticeable regression in the economy. In 2100, under the mandatory emission restrictions of the Kyoto Protocol, the temperature would be diminished by 0.2°C, or, to use the figures of the global warmers, with Kyoto, the temperature increase that we would experience in the year 2094, would be postponed until the year 2100. Thus, the Kyoto Protocol buys the world six years.[7]

But the losses resulting from the compliance with the Kyoto Protocol would reach $400 billion in the United States alone. The reduction of the world domestic product, when added up across the whole century, would reach $1.8 trillion, while the so-called benefits of the emissions reduction from the Kyoto Protocol are around $0.12 trillion.[8] By 2050, in Western Europe and in Japan, the Gross National Product would be reduced by 0.5 percent in comparison with 1994; in Eastern Europe, this reduction would reach 3 percent, and in Russia 3.4 percent.[8] Experts working for the Canadian government concluded that the implementation of the Kyoto Protocol would necessitate energy rationing, which would resemble the gasoline rationing during World War II.[9]

Climate Change Reflects Natural Planetary Events

In fact, the recent climate developments are not something unusual; they reflect a natural course of planetary events. From time immemorial, alternate warm and cold cycles have followed each other, with a periodicity ranging from tens of millions to several years. The cycles were most probably dependent on the extraterrestrial changes occurring in the Sun and in the Sun's neighborhood.

Short term changes—those occurring in a few years—are caused by terrestrial factors such as large volcanic explosions, which inject dust into the stratosphere, and the phenomenon of El Niño, which depends on the variations in oceanic currents. Thermal energy produced by natural radionuclides that are present in the 1-kilometer-thick layer of the Earth's crust, contributed about 117 kilojoules per year per square meter of the primitive Earth. As a result of the decay of these long-lived radionuclides, their annual contribution is now only 33.4 kilojoules per square meter.[10]

This nuclear heat, however, plays a minor role among the terrestrial factors, in comparison with the "greenhouse effects" caused by absorption by some atmospheric gases of the solar radiation reflected from the surface of the Earth. Without the greenhouse effect, the average near-surface air temperature would be –18°C, and not +15°C, as it is now. The most impor-

The author (right) working with ion exchange columns in a laboratory tent at Kahiltna Glacier, Alaska, 1977.

tant among these "greenhouse gases" is water vapor, which is responsible for about 96 to 99 percent of the greenhouse effect. Among the other greenhouse gases (CO_2, CH_4, CFCs, N_2O, and O_3), the most important is CO_2, which contributes only 3 percent to the total greenhouse effect.[11, 12] The man-made CO_2 contribution to this effect may be about 0.05 to 0.25 percent.[13]

Now we are near the middle of the Sun's lifetime, about 5 billion years since its formation, and about 7 billion years before its final contraction into a hot white dwarf,[14] the heat of which will smother the Earth, killing all life. At the start of Sun's career, its irradiance was about 30 percent lower than it is now. This probably was one of the reasons for the Precambrian cold periods. In 1989, Joseph Kirschvink found 700 million-year-old rocks, near Adelaide, Australia, holding traces of the past glaciers. However, the magnetic signal of these rocks indicates that at that time, the glaciers were located at the Equator. This means that the whole of the Earth was then covered with ice. In 1992, Kirschvink called this stage of the planet the "Snowball Earth," and found that this phenomenon occurred many times in the Precambrian period. One such Snowball Earth appeared 2.4 billion years ago.

Although large glaciations drastically decreased biological productivity, the successive melting of vast amounts of oceanic ice caused an enormous blooming of cyanobacteria, which produced vast amounts of oxygen. This was highly toxic for most of the organisms living in that time. Consequently, 2.4 billion years ago, living organisms were forced to develop defense mechanisms against the deadly effects of oxygen radicals.[15] These same mechanisms protect us against the effects of ionizing radiation. Without these mechanisms, life could not have developed in the past, and we could not live with the current flux of spontaneous DNA damages produced by the oxygen radicals which are formed in metabolism of this gas. In each mammalian cell, about 70 million spontaneous DNA damages occur during one year, but only 5 of those DNA damages are the result of the average natural radiation dose.[16, 17]

Both the oxygen atmosphere and the incredibly efficient mechanism of DNA protection and repair, developed in this ancient epoch, were probably induced by dramatic changes of climate.

During the Phanerozoic (the past 545 million years), the Earth passed through eight great climate cycles, each lasting 50 to 90 million years. Four of them ("Icehouses") were about 4°C colder than the four warmer ones ("Greenhouses").[18] These long cycles were likely caused by passages of our Solar System through the spiral arms of the Milky Way. On its way, the Solar System passed through areas of intensive star creation, with frequent explosions of novas and supernovas. In these regions, the intensity of galactic cosmic radiation reaching the Earth is up to 100 times higher than average. The higher level of cosmic radiation in the Earth's troposphere causes greater formation of clouds, which reflect the incoming solar radiation back into space. This results in a cooler climate (see below). Then the Solar System travels to quieter areas where cosmic radiation is fainter, fewer clouds are formed in our troposphere, and the climate warms.[18]

Upon these enormously long climate cycles, counting tens of millions years each (Figure 1), are superimposed shorter cycles, which strengthen or weaken the long ones. During the past million years,there were 8 to 10 Ice Ages, each only about 100,000 years long, interspersed with short, warm interglacial periods each of about 10,000 years' duration.

Over the past thousand years, multiple 50-year periods have been much warmer that any analogous period in the 20th Century, and the changes have been much more violent than those observed today. Such are the findings of an analysis of more than 240 publications, performed by a team of CalTech and Harvard University scientists.[19, 20] In this study, thousands of assay results for the so-called proxy temperature indicators have been examined. They included historical records; annual growth ring thickness measurements; isotope changes in ice cores, lake sediments, wood, corals, stalagmites, biological fossils, and in cellulose preserved in peat; changes in ocean sediments; glacier ranges; geological bore-hole temperatures; microfauna variations in sediments; forest line movement, and so on.

Similar evidence comes also from more direct measurements of the temperature preserved in the Greenland ice cap (Figure 2). These studies stand in stark contradiction to the much smaller study,[21b] which shows a "hockey stick" curve, with the outstanding high temperature in the 20th Century, and a rather flat and slightly decreasing trend during the rest of the past millennium. The study, by Mann et al., is in opposition to the multitude of publications supporting the evidence that during the past 1,000 years, the phenomena of Medieval Warming and the Little Ice Age had a global range, and that the contemporary period does not differ from the previous natural climatic changes. However, the Mann et al. study was incorporated into the IPCC's 2001 (TAR) report, as a main proof that the 20th Century warming was unprecedented, and it was enthusiastically used by aficionados of the Kyoto

Protocol to promote their case.

In their meticulous study, Soon and Baliunas[19, 20] criticized, in passing, the Mann et al. publications for improper calibration of the proxy data, and for statistical and other methodical errors. More in-depth and crushing criticisms of the work of Mann et al. were presented recently by McIntyre and McKitrick[22] who demonstrated that the conclusions of Mann et al. are based on flawed calculations, incorrect data, and biased selection of the climatic record. Using the original data sets supplied to them by author Michael Mann, McIntyre and McKitrick discovered many mistakes in the Mann et al. papers—for example, allocating measurements to wrong years, filling tables with identical numbers for different proxies in different years, using obsolete data that have been revised by the original researchers, and so on. Typical of these "errors" was, for example, their stopping the central England temperature series, without explanation, at 1730, even though data are available back to 1659, thus hiding a major 17th Century cold period. McIntyre and McKitrick not only criticized the work done by Mann et al., but also, after correcting all errors, analyzed their data set using Mann's own methodology. The result of this superseding study demonstrates that the 20th Century temperature has not been exceptional during the past 600 years. Further, it demonstrates the falsity of the IPCC's statement in its 2001 report, based on Mann et al., that the 1990s was "likely the warmest decade,"

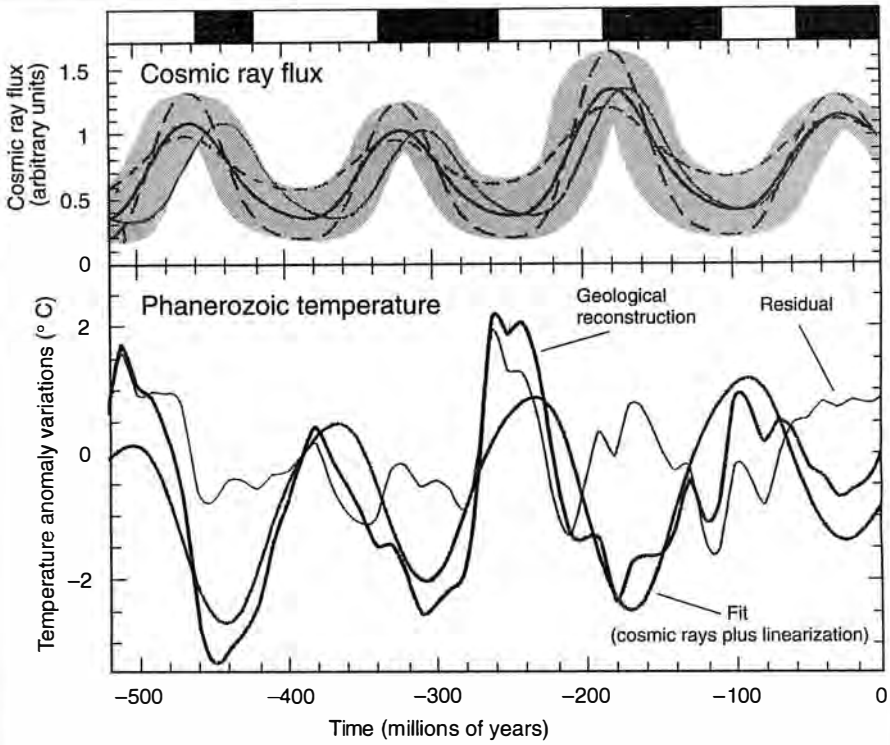
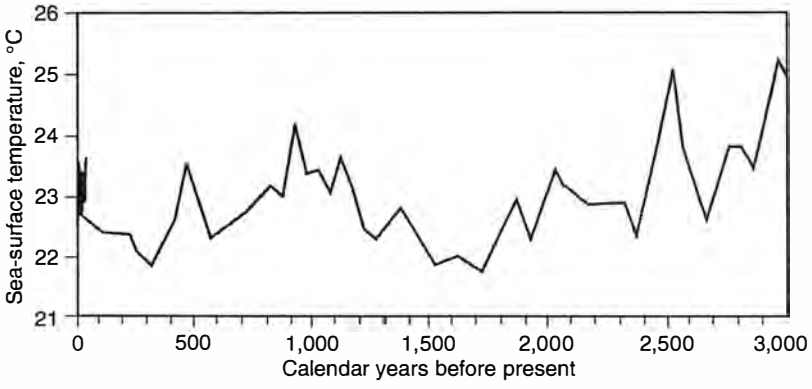


Figure 1
COSMIC RAY FLUX AND CLIMATIC CHANGES
For the past 545 million years, cosmic ray flux has been correlated with temperature.

Source: Adapted from N.J. Shaviv, and J. Veizer, 2003. "Celestial Driver of Phanerozoic Climate?" *GSA Today* (July), pp. 4-10

Figure 2
TEMPERATURE VARIATIONS FOR THE PAST 3,000 YEARS



Temperature can be inferred from the isotope ratios for carbon (carbon-12 and carbon-13C) and oxygen (oxygen-16 and oxygen-18) in the skeletons of sea foraminifers, in the bottom deposits in Sargasso Sea (Northern Atlantic). These indicate that in the last 3,000 years, the climate on Earth has been constantly changing, and the scope of changes in modern times does not differ from those of the past.

Shown are the Medieval Optimum (1,000 years ago) the beginnings of the Holocenic Optimum (2,500 years ago), and also the Little Ice Age (ca. 500 years ago) from which we are still emerging. The Early Middle Ages also witnessed a strong climate cooling, which had an impact on Europe's economic and cultural decline in this period.

Source: Adapted from L.D. Keigwin, et al., 1994. "The Role of the Deep Ocean in North Atlantic Climate Change between 70 and 130 kyr Ago." *Nature*, Vol. 371, pp. 323-326

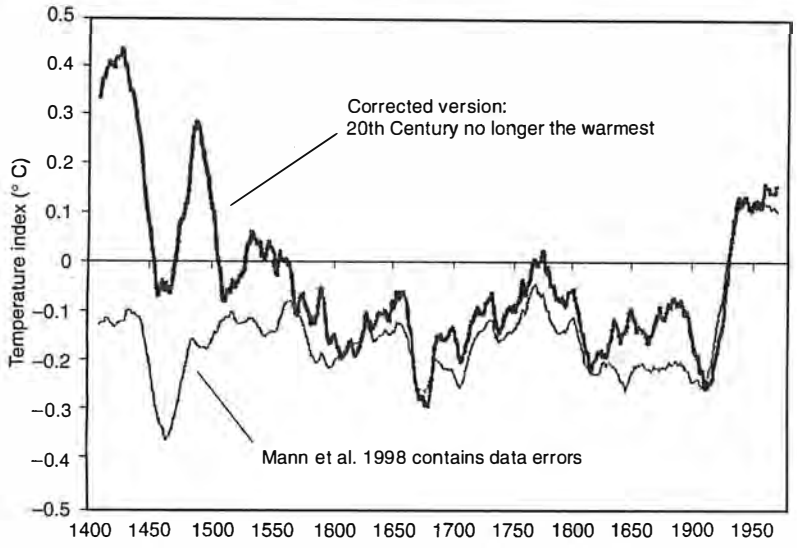


Figure 3
THE SO-CALLED 'HOCKEY STICK' TEMPERATURE CURVE AND ITS CORRECTED VERSION

The thin line is the "hockey stick" curve allegedly showing recent temperatures (the handle of the stick at right) as the highest since 1400. Authors of the curve, Mann, Bradley et al. (see Reference 21), claimed that "temperatures in the latter half of the 20th century were unprecedented," that "even the warmer intervals in the reconstruction pale in comparison with mid-to late 20th-century temperatures," and that the 1990s was "likely the warmest decade." The IPCC adopted the Mann et al. analysis, calling 1998 the "warmest year" of the millennium.

The thick line is the corrected curve, which is derived from the same data set, showing the 20th Century temperatures to be colder than those of the 15th Century, and actually emerging from the Little Ice Age around the turn of the 20th Century.

Source: Adapted from S. McIntyre and R. McKitrick, 2003. "Corrections to the Mann et al. (1998) Proxy Data Base and Northern Hemispheric Average Temperature Series." *Energy & Environment*, Vol. 14, No. 6, pp. 751-771

and 1998 the "warmest year of the millennium" (Figure 3).

The McIntyre and McKitrick paper was reviewed before its submission for publication by leading experts in mathematics and statistics, geology, paleoclimatology, and physics (among them were R. Carter, R. Courtney, D. Douglas, H. Erren, C. Essex, W. Kininmonth, and T. Landscheidt), and it was then peer-reviewed by the reviewers of the prestigious British journal *Energy & Environment*.

Two questions arise in this respect. How could the 1998 Mann et al. paper, with all those errors, have passed peer review for *Nature* magazine? And how could it pass the reviewing process at the IPCC? This affair sadly reflects upon the quality of science being performed in this body.

The Mann et al. papers had a political edge: They served as a counterweight against President George W. Bush's negative stand toward the Kyoto Protocol as "fatally flawed," and his attempt to lessen the economic global catastrophe that Kyoto would induce. An unexpected contribution in this fight recently came from President Vladimir Putin, his chief economic advisor Andrei Illarionov, and from many scientists attending the World Climate Change Conference that was held in Moscow between September 29 and October 3, 2003. Opening the conference, Putin stated that the Kyoto Protocol was "scientifically flawed," and that "Even 100 percent compliance with the Kyoto Protocol won't reverse climate change." And in response to those calling for quick ratification of the Kyoto Protocol, Putin mentioned half jokingly: "They often say that Russia is a northern country and if temperature get warmer by 2 or 3 degrees Celsius, it's not such a bad thing. We could spend less on warm coats, and agricultural experts say grain harvests would increase further."

Putin also stated that Moscow would

> be reluctant to make decisions on just financial considerations. Our first concern would be the lofty idea and goals we set ourselves and not short-term economic benefits. . . . The government is thoroughly considering and studying this issue, studying the entire complex and difficult problems linked with it. The decision will be made after this work has been completed. And, of course, it will take into account the national interests of the Russian Federation.

Putin's chief advisor, Andrei Illarionov, was blunt: "The Kyoto Protocol will stymie economic growth. It will doom Russia to poverty, weakness, and backwardness." To the experts gathered in Moscow he posed 10 thoughtful questions, all of which shake the man-made global warming hypothesis. The proponents of global warming did not provide satisfying answers. Even the basic questions posed by the chairman of the organizing committee, Professor Yuri Izrael, were not answered: "What is really going on this planet—warming or cooling?" and "Will ratifying the Kyoto Protocol improve the climate, stabilize it, or make it worse," he asked.

At the end of the conference two things became clear: (1) the scientific world is far from any "consensus," so often vaunted by the IPCC, on man-made climatic warming. (The chairman of the conference acknowledged that the scientists who questioned the Kyoto "consensus" made up 90 percent of the contribution from the floor.) (2) Without ratification by Russia, the Kyoto Protocol will collapse.

From what President Putin said at the Moscow conference, it seems that Russia will succumb neither to short-term, seemingly lucrative proposals of selling spare Russian CO_2 emis-

sion quotas for about $8 billion per year, nor to the saber-rattling by the European Union Environmental Commissioner Margot Wallstrom, who warned Russia during the conference that it "would lose politically and economically by not ratifying the Kyoto Protocol." It seems that now Russia may stop global restrictions in CO_2 emissions, and save the world from what Sir Fred Hoyle correctly defined in 1996 as "ruining the world's industries and returning us all to the Dark Ages."

Nature Likes Warmth

Cold periods have always meant human calamities and ecosystem disasters. For example, the last cold period, the so-called Little Ice Age, brought famine and epidemics to Europe and in Finland that contributed to the extinction of two thirds of the population. On the other hand, during the warm periods, plants, animals, and human communities thrived and prospered.

For many years we have been taught that climate warming will cause a series of disasters: ocean level rise, Arctic ecological disaster, droughts and floods, agriculture catastrophes, rising numbers and violence of hurricanes, epidemics of infectious and parasitic diseases, and so on. The impacts of warming, so it seems, must be always negative, never positive. But is it really so?

Let's take a look at the Arctic. At the request of the Norwegian government's Interdepartmental Climatic Group, together with three colleagues from the Norsk Polar Institute, I have studied the impact of a possible climate warming on the Arctic flora and fauna in the region of Svalbard. Special concerns involved possible polar bear extinction. Our report [23] states that in the period from 1920 to 1988, the temperature on Spitsbergen and on adjacent Jan Mayen isle *dropped* by nearly 2°C, contrary to the predictions by Dr. Schneider and his followers. For the study's sake, however, we made an assumption that, by some miracle, the Arctic climate would be warmed up by a few degrees Celsius, with a higher carbon dioxide concentration in the air. Under this assumption, we investigated the fate of plants, sea plankton, fish, bears, reindeer, seals, and millions of birds inhabiting this region.

It turned out that at higher CO_2 concentration and higher temperatures, the productivity of the Arctic ecological system always rises. Historic records and modern statistics show that in warmer periods, more fish have been caught in the Barents Sea, and the populations of reindeer, birds, seals, and bears also expanded. Over land, the mass of vegetation for reindeer increased, and in the sea, plankton became more plentiful. This allowed the fish population to increase, expanding food resources for birds and seals, which, in turn, are eaten by polar bears. In conclusion: Climate warming would be beneficial for the whole system of life in the Arctic, and polar bears would be more numerous than today.

Our interdepartmental sponsors then gave us a piece of their minds: "That's not the way to get the funds for research!" They were right.

Fear Propaganda

The strongest fears of the population concern the melting of mountain glaciers and parts of the Greenland and Antarctic continental glaciers, which supposedly would lead to a rise in the oceanic level by 29 centimeters in 2030, and by 71 cm in 2070. Some forecasts predict that this increase of ocean levels could reach even 367 cm.[24] In this view, islands, coastal regions, and large metropolitan cities would be flooded, and whole nations would be forced to migrate. On October 10, 1991, *The New York Times* announced that as soon as 2000, the rising ocean level would compel the emigration of a few million people.

Doomsayers preaching the horrors of warming are not troubled by the fact that in the Middle Ages, when for a few hundred years it was warmer than it is now, neither the Maldive atolls nor the Pacific archipelagos were flooded. Global oceanic levels have been rising for some hundreds or thousands of years (the causes of this phenomenon are not clear). In the last 100 years, this increase amounted to 10 cm to 20 cm,[24] but it does not seem to be accelerated by the 20th Century warming. It turns out that in warmer climates, there is more water that evaporates from the ocean (and subsequently falls as snow on the Greenland and Antarctic ice caps) than there is water that flows to the seas from melting glaciers.[17]

Since the 1970s, the glaciers of the Arctic, Greenland, and the Antarctic have ceased to retreat, and have started to grow. On January 18, 2002, the journal *Science* published the results of satellite-borne radar and ice core studies performed by scientists from CalTech's Jet Propulsion Laboratory and the

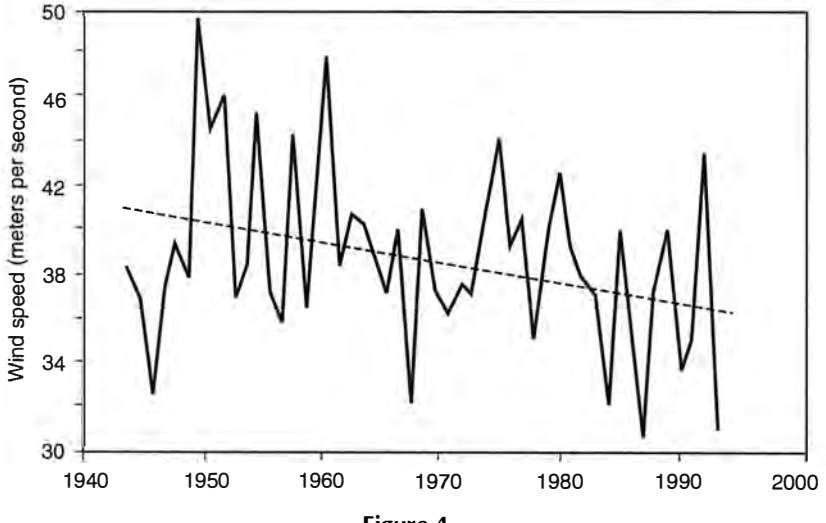


Figure 4
MEAN ANNUAL MAXIMUM WIND SPEED IN ATLANTIC HURRICANES
The maximum wind velocity for hurricanes over the Atlantic Ocean in 1940-1993 has decreased by 5 km per hour, that is, by approximately 12 percent. The dotted line shows the linear trend.

Source: Adapted from C.W. Landsea et al., 1996. "Downward Trends in the Frequency of Intense Atlantic Hurricanes during the Past Five Decades." *Geographical Research Letters*, Vol. 23, No. 13, pp. 1697-1700

University of California at Santa Cruz. These results indicate that the Antarctic ice flow has been slowed, and sometimes even stopped, and that this has resulted in the thickening of the continental glacier at a rate of 26.8 billion tons a year.[25]

In 1999, a Polish Academy of Sciences paper was prepared as a source material for a report titled "Forecast of the Defense Conditions for the Republic of Poland in 2001-2020." The paper implied that the increase of atmospheric precipitation by 23 percent in Poland, which was presumed to be caused by global warming, would be detrimental. (Imagine stating this in a country where 38 percent of the area suffers from permanent surface water deficit!) The same paper also deemed an extension of the vegetation period by 60 to 120 days as a disaster. Truly, a possibility of doubling the crop rotation, or even prolonging by four months the harvest of radishes, makes for a horrific vision in the minds of the authors of this paper.

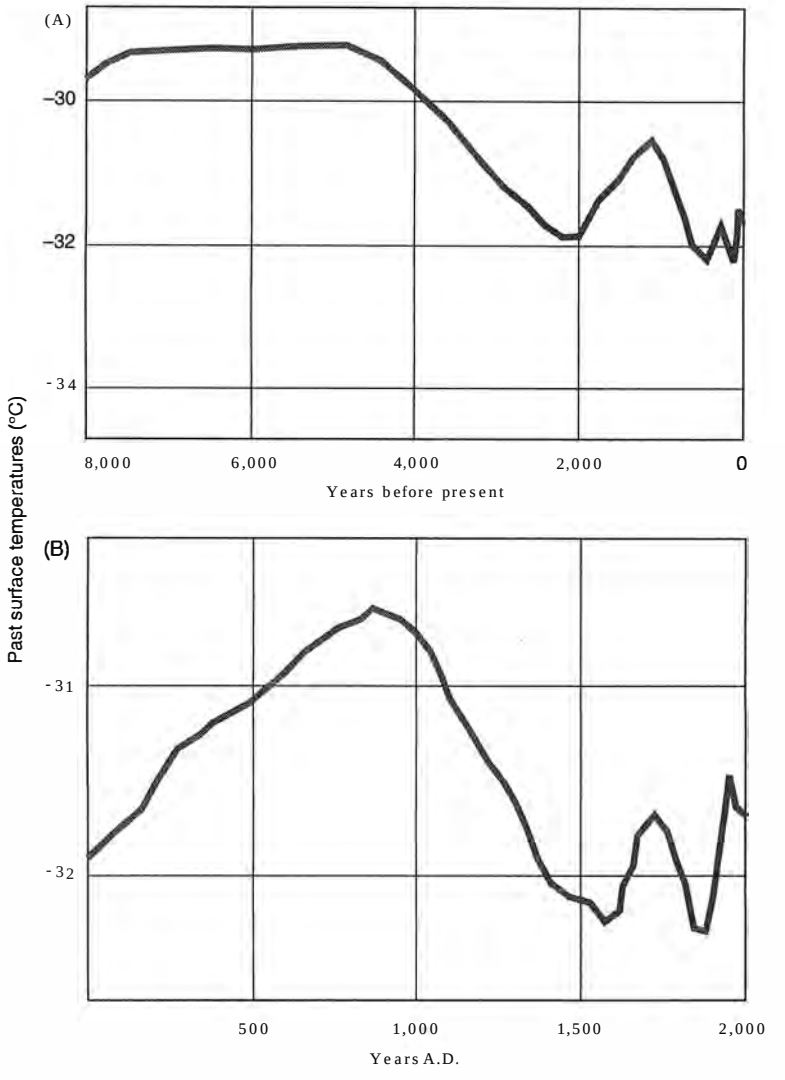


Figure 5
DIRECT TEMPERATURES MEASURED IN A GREENLAND GLACIER BORE HOLE

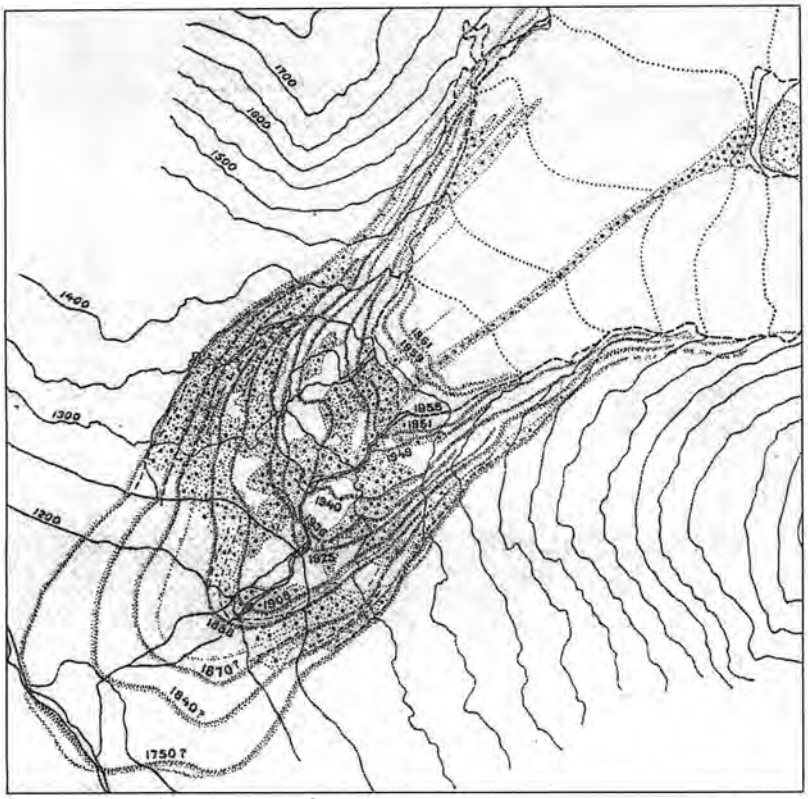
Snowflakes falling through the atmosphere have the same temperature as the surrounding air. The ice formed from these snowflakes conducts heat very badly, and its original temperature is retained for thousands of years. Shown are (A) The temperature of air over Greenland in the last 8,000 years where the so-called Holocenic Warming (3,500 to 6,000 years ago) is visible; (B) Our epoch, showing the Middle Ages Warming (900-1100) and the Little Ice Age (1350-1880).

Source: D. Dahl-Jensen, et al., 1998. "Past Temperatures Directly from the Greenland Ice Sheet:' *Science*, Vol. 282, NO. 9 (October), pp. 268-271

Newspapers continuously write about the increasing frequency and power of the storms. The facts, however, speak otherwise. I cite here only some few data from Poland, but there are plenty of data from all over the world. In Cracow, in 1896-1995, the number of storms with hail and precipitation exceeding 20 millimeters has decreased continuously, and after 1930, the number of all storms decreased.[26] In 1813 to 1994, the frequency and magnitude of floods of Vistula River in Cracow not only did not increase but, since 1940, have significantly decreased.[27] Also, measurements in the Kolobrzeg Baltic Sea harbor indicate that the number of gales has not increased between 1901 and 1990.[28] Similar observations apply to the 20th Century hurricanes over the Atlantic Ocean (Figure 4, p. 57) and worldwide.

Computer Predictions Overturned

Contrary to the global warmers' computer predictions, the concentrations of carbon dioxide in the atmosphere, the most important among the man-made greenhouse gases, were out of phase with the changes of near-surface air temperature, both recently and in the distant past. This is clearly seen in Antarctic and Greenland ice cores, where high CO_2 concentrations in air bubbles preserved in polar ice appear 1,000 to 13,000 years after a change in the isotopic composition of H_2O, signalling the warming of the atmosphere.[29] In ancient times, the CO_2 concentration in the air has been significantly higher than today, with no dramatic impact on the temperature. In the Eocene period (50 million years ago), this concentration was 6 times larger than now, but the temperature was only 1.5°C higher. In the Cretaceous period (90 million years ago), the CO_2 concentration was 7 times higher than today, and in the Carboniferous period (340 million years ago), the CO_2 concentration was nearly 12 times higher.[30] When the CO_2 concentration was 18 times higher, 440 million years ago (during the Ordovician period), glaciers



Source: Adapted from O. Liestol, *Storbreen Glacier in Jotunheimen, Norway.* Oslo: Norsk Polarinstitutt. 1967, pp. 1-63

Figure 6
RETREAT OF THE STORBREEN GLACIER IN NORWAY

The Storbreen Glacier front was in retreat between 1750 and 1961. The retreat started long before the onset of carbon-dioxide-linked global warming.

The Storbreen glacier is located in southern Norway, in the western part of Jotunheimen, a mountain area.

existed on the continents of both hemispheres.

At the end of the 19th Century, the amount of CO_2 discharged into the atmosphere by world industry was 13 times smaller than now.[31] But the climate at that time had warmed up, as a result of natural causes, emerging from the 500-year-long Little Ice Age, which prevailed approximately from 1350 to 1880. This was not a regional European phenomenon, but extended throughout the whole Earth[19, 20] During this epoch, the average global temperature was 1°C lower than now. Festivals were organized on the frozen Thames River, and people travelled from Poland to Sweden, crossing the Baltic Sea on sleighs and staying overnight in a tavern build on ice.

This epoch is well illustrated by the paintings by Pieter Breughel and Hendrick Avercamp. In the mountains of Scotland, the snowline stretched down 300 to 400 meters lower than today. In the vicinity of Iceland and Greenland, the sea ice was so extensive that the access to a Greenland Viking colony, established in 985, was completely cut off; the colony was finally smashed by the Little Ice Age.

All this was preceded by the Middle Ages Warming, which lasted for more than 300 years (900 to 1100), and during which the temperature reached its maximum (1.5°C more than today) around the year 990. Both the Little Ice Age and the Middle Ages Warming, were not regional phenomena as implied by Mann and his co-authors,[32] but were global and were observed around the North Atlantic Ocean, in Europe, Asia, South America, Australia, and Antarctica.[33, 34]

During the Medieval Warming, the forest boundary in Canada reached 130 kilometers farther north than today, and in Poland, England, and Scotland vineyards for altar wine production flourished—only to be destroyed by the Little Ice Age. Still earlier, 3,500 to 6,000 years ago, a long-lasting Holocene Warming took place, when the average air temperature exceeded the current one by 2°C (Figure 5).

The Little Ice Age is not yet completely behind us. Stenothermal (warm-loving) diatom species, which reigned in the Baltic Sea during the Medieval Warming, have not yet returned.[35] Diatom assemblages obtained from sediment core from the seabed of the north Icelandic shelf indicate that during the past 4,600 years the warmest summer sea-surface temperatures, about 8.1°C, occurred at 4,400 years before the present. Thereafter the climate cooled, with a warmer interlude of about 1°C near 850 years before the present. This was followed again by a cold span of the Little Ice Age, which brought mean summer sea-surface temperatures down by about 2.2°C. Today's temperature of only 6.3°C still has not reached the Holocene warming level of 8.1°C.[36]

The fastest temperature growth occurred in the early 20th Century, and the maximum was reached around 1940. It was then that the mountain and Arctic glaciers were shrinking violently, but their retreat from the record sizes (during the coldest part of Little Ice Age) had started 200 years earlier, around 1750, when no one even dreamed of industrial CO_2 emissions. An illustration of this process is a map of glacier front changes between 1750 and 1961, at what is probably the best studied Storbreen Glacier in Norway, in which the first meas-

clipart.com

The 500-year-long Little Ice Age prevailed from about 1350 to 1880, throughout the entire Earth, with temperatures averaging 1° lower than today's. The Baltic Sea could be traversed by sleigh from Poland to Sweden, staying overnight in taverns built on the ice! The paintings by Pieter Breughel and Hendrick Avercamp illustrate the period. Here, Breughel's "The Hunters."

urements of CO_2 in ice were performed in 1956 (Figure 6). The attack of glaciers on Swiss villages in the 17th and 18th centuries—sometimes the velocity of ice movement reached 20 meters annually, destroying homes and fields—was perceived as a calamity. Yet, the withdrawal of glaciers in the 20th Century has been deemed, somewhat foolishly, to be a disaster.

Since the exceptionally hot 1940s, until 1975, the Earth's climate cooled down by about 0.3°C, despite a more than three-fold increase of annual industrial CO_2 emission during this period. After 1975, meteorological station measurements indicated that the average global temperature started to rise again, despite the decline in "human" CO_2 emissions. However, it turns out that it was probably a measuring artifact, brought about by the growth of the cities and resulting "urban heat island" effect. Meteorological stations, which used to be sited outside of urban centers, have been absorbed by the cities, where the temperature is higher than in the countryside.

Outside the cities of the United States and Europe, the observed temperature is lower, rather than higher, as demonstrated by the data of NASA's Goddard Institute, reviewed recently by J. Daly.[37]

The same is true also for the polar regions, where the models predict the largest increase in air temperature. As stated by Rajmund Przybylak, a climatologist from the Nicolaus Copernicus University in Torun, Poland, in polar regions "warming and cooling epochs should be seen most clearly. . . and should also occur earlier than in other parts of the world." Therefore, these regions, he says, "should play a very important role in the detection of global changes."[38]

Przybylak collected data covering the period 1874 to 2000, from 46 Arctic and subarctic stations managed by Danish, Norwegian, American, Canadian, and Russian meteorological and other institutes. His study demonstrates the following: (1) In the Arctic, the highest temperatures occurred clearly in the 1930s; (2) even in the 1950s, the temperature was higher than in the 1990s; (3) since the mid-1970s, the annual temperature shows no clear trend; and (4) the temperature in Greenland in the last 10 to 20 years is similar to that observed in the 19th Century. These findings are similar to temperature changes in the Arctic found in data collected by NASA,[37, 38] and in earlier studies reviewed by Jaworowski.[13]

In a new study covering the air surface temperature and sea level pressure data from 70 stations in the circum-Arctic region northward of 62°N, over the period from 1875 to 2000, Polyakov et al.[39] found that the temperature data consist of two cold and two warm phases of multi-decadal variability, at a time scale of 50 to 80 years, superimposed on a background of a long warming trend. This variability appears to originate in the North Atlantic, and is likely induced by slow changes in oceanic thermohaline circulation, and in the complex interactions between the Arctic and North Atlantic.

The two warm periods occurred in the Arctic in the late 1930s through the early 1940s, and in the 1980s through the 1990s. The earlier period was warmer than the last two decades. Since 1875, the Arctic has warmed by 1.2°C, and for the entire recorded temperature record, the temperature warming trend was 0.094°C per decade. For the 20th Century alone, the warming trend was 0.05°C per decade; that is, close to the Northern Hemispheric trend of 0.06°C per decade. Because the temperature in the 1930s-1940s was higher than in recent decades, a trend calculated for the period 1920 to the present actually shows cooling.

The Arctic Sea Ice Changes

The Polyakov study (Reference 39) also concludes that the warming trend alone cannot explain the retreat of Arctic sea ice observed in the 1980-1990s, which was probably caused by the shift in the atmospheric pressure pattern from anti-cyclonic to cyclonic.

The mechanism of sea ice changes is incredibly complex, and it is extremely difficult to identify the rather short-term anthropogenic influence from the background of natural phenomena, which are both long and short term. Depending on the period of time studied, the records containing only a few years to a few decades of data, yield different trends. For example, Winsor[40] reported that six submarine cruises between 1991-1997, transecting the Central Arctic Basin from 76°N to 90°N and around the North Pole (above 87°N),

found a slight increasing trend in sea ice thickness. Vinje in 1999, 2001, and 2003[41, 43] reviewed observations of the extent of ice in the Nordic Seas measured in April 1864-1998, and also back in time for a full 400 years. Sea-ice extent has decreased there by 33 percent over the past 135 years. However, nearly half of this decrease was observed over the period 1864-1900. The first half of this decline occurred over a period when the CO_2 concentration in air rose by only 7 parts per million volume (ppmv), whereas for the second half of the decline, the CO_2 content rose by over 70 ppmv. This suggests that the rise of CO_2 content in the air has nothing to do with the sea-ice cover.

Vinje[42] stated that the "annual melt-backs of the magnitude observed after about 1930 have not been observed in the Barents Sea since the 18th Century temperature optimum," which was followed by "a fall in the Northern Hemisphere mean temperature of about 0.6°C over the last few decades of the 18th Century," which temperature has just now been finally erased by "a rise of about 0.7°C over a period 1800-2000." Consequently, the Northern Hemisphere would appear to be not much warmer now (and the extent of Barents Sea ice cover not much less now) than it was during the 1700s, when the CO_2 air concentration was claimed to be 90 to 100 ppmv less than it is now. (The validity of this claim was criticized by Jaworowski in References 29 and 44.)

Even high-sensitivity short-term determinations of surface air temperature or sea-ice, covering one or two decades (for example, satellite observations between 1981 and 2001, appearing in the Nov. 1, 2001, issue of the *Journal of Climate,* showing a 9 percent per decade decline of Arctic sea-ice), are not the best basis for the determination of man-made impact on the climate of polar regions. This is valid also for Antarctic studies, where over the past 18 years the net trend in the mean sea-ice edge has expanded northward by 0.011 degree of latitude per year, indicating that the global extent of sea-ice may be on the rise.[45]

Courtesy of Zbigniew Jaworowski

Collecting ice samples at the Elena Glacier, a tributary of the Stanley Glacier, Ruwenzori Mountains, Uganda, 4,755 meters above sea level.

Antarctic Cooling

Also, in the interior regions of Antarctica after 1941, either cooling or no temperature trend was observed. At the South Pole Amundsen-Scott Station, from 1957 to 2000, the temperature decreased by approximately 1.5°C,[37, 46] although the CO_2 concentrations increased there during this period from 313.7[31] to less than 360 ppmv (Figure 7). The decrease of temperature may be related to the El Niño oscillation,[47] and to the decline in the amount of solar radiation reaching Antarctica (0.28 watt per square meter per year between 1959 and 1988).[48]

On the global scale, the most objective measurements of the temperature in the lower troposphere, conducted since 1979 by American satellites (with no interference from "heat islands"), indicated up to 1998 not a climate warming, but rather a modest cooling (–0.14°C per decade—see Figure 8). In 1999, the temperature rose because of the El Niño effect (cyclic variations in the sea current flowing from the Antarctic, along Chile and Peru, to the equator), changing the 1979-2003 trend into a slight

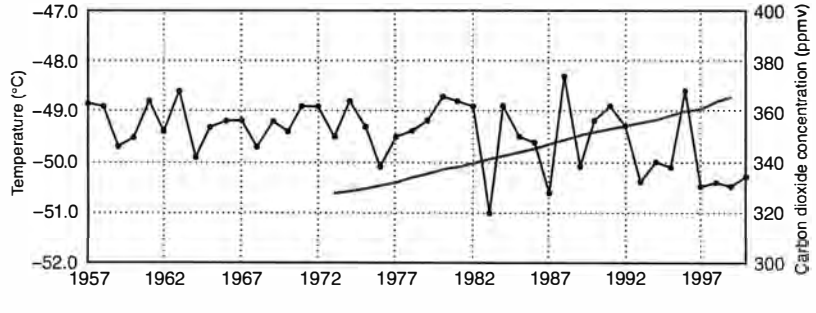


Figure 7
SURFACE TEMPERATURE AND CARBON DIOXIDE AT THE SOUTH POLE (1957-2000)

What's the connection between CO_2 and temperature at the South Pole? Either cooling or no correlation. The upper line graphs changes of the surface temperature at Amundsen-Scott Station at the South Pole between 1957 and 2000. The line starting in 1973 graphs concentrations of CO_2 in air between 1973 and 1999.

Source: J.L. Daly, 2003. "What the Stations Say."

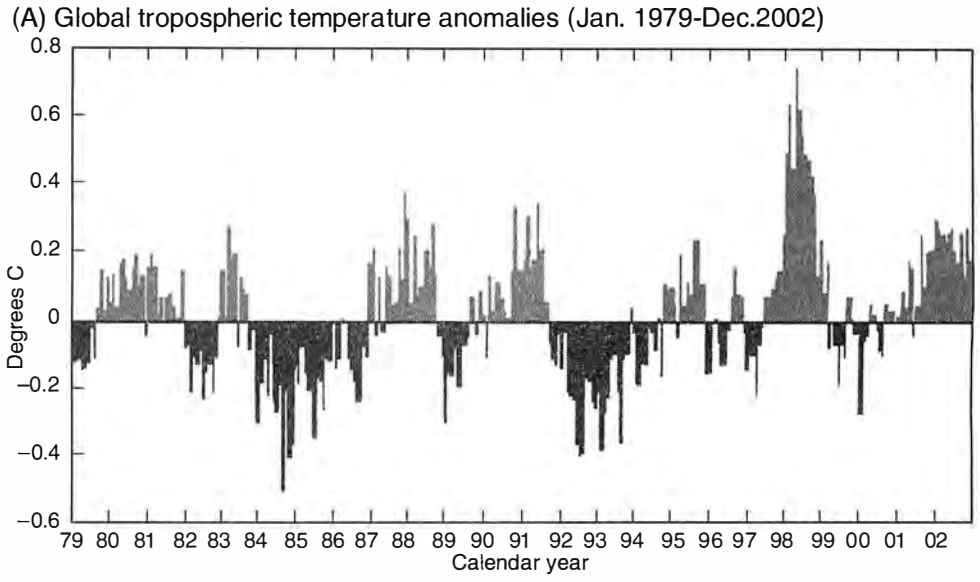
warming. However, since 1994, the satellite data show a deep cooling of the stratosphere.

The Cosmic Ray Connection

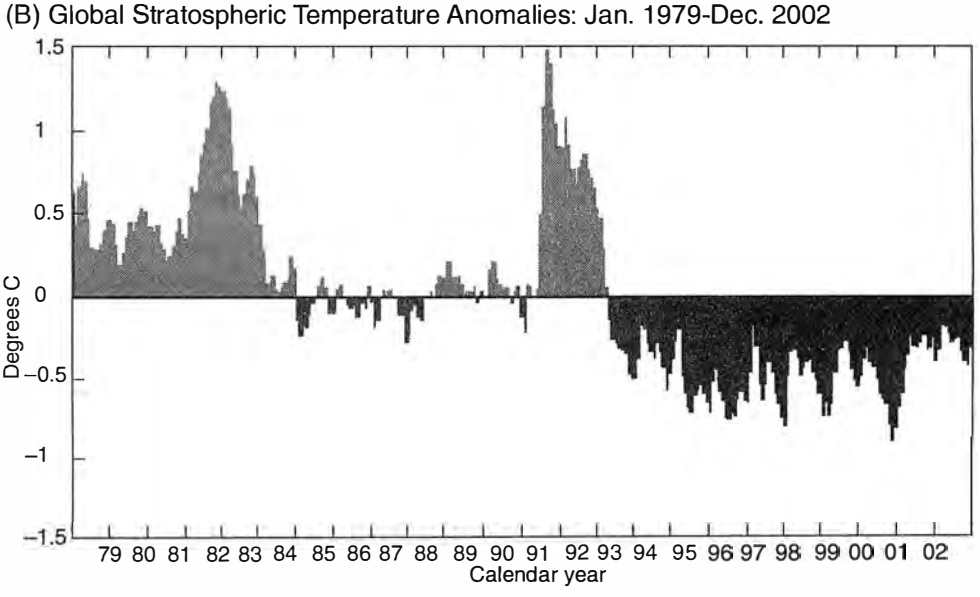
The atmospheric temperature variations do not follow the changes in the concentrations of CO_2 and other trace greenhouse gases. However, they are consistent with the changes in Sun's activity, which run in cycles of 11-year and 90-years' duration. This has been known since 1982, when it was noted that in the period 1000 to 1950, the air temperature closely followed the cyclic activity of our diurnal star.[49] Data from 1865 to 1985, published in 1991, exhibited an astonishing

Figure 8
GLOBAL TEMPERATURE ANOMALIES (1979-2002)

Since 1979, the equipment deployed by NASA on 9 TIROS-N satellites has performed 270,000 measurements daily of the temperature in the lower troposphere (from the Earth's surface up to 8 km) and in the lower stratosphere (14 to 22 km). The measurements are taken every 12 hours, virtually all over the globe, with no disturbance from local effects, such as urban "heat islands."



(A) shows average monthly temperatures of the lower troposphere, which have alternately warmed and cooled in the last 24 years. The more sizable temperature rise in 1998 was caused by the El Niño effect. In the entire period, there is a weak cooling of approximately –0.06°C per decade.



(B) shows the deviations in temperature from the seasonally adjusted average in the lower stratosphere. The 1982 temperature rise was caused by the pollution of the stratosphere with sulfuric acid aerosols from the eruption of volcano El Chichon; similarly, the rise in 1991 was caused by the eruption of Mt. Pinatubo in the Philippines. The coldest month recorded in the stratosphere occurred in September 1996.

These measurements are in conflict both with the results of ground measurements, which indicate a sharp rise in temperature, and with the computerized models, which predicted that the lower troposphere would be heated more than the Earth's surface.

Source: Adapted from R. Spencer and J. Christy, 2003. "What Microwaves Teach Us About the Atmosphere," http://www.ghcc.msfc.nasa.gov/overview/microwave.html, 2003.

correspondence between the temperature of the Northern Hemisphere and the 11-year cycles of the sunspot appearances, which are a measure of Sun's activity.[50, 51] The variations in solar radiation observed between 1880 and 1993 could account for 71 percent of the global mean temperature variance (compared to 51 percent for the greenhouse gases' part alone), and correspond to a global temperature variance of about 0.4°C.[34]

However, in 1997, it suddenly became apparent that the decisive impact on climate change fluctuations comes not from the Sun, but rather from cosmic radiation. This came as a great surprise, because the energy brought to the Earth by cosmic radiation is many times smaller than that from solar radiation. The secret lies in the clouds: The impact of clouds on climate and temperature is more than a hundred times stronger than that of carbon dioxide. Even if the CO_2 concentration in the air were doubled, its greenhouse effect would be cancelled by a mere 1 percent rise in cloudiness: The reason is simply that greater cloudiness means a larger deflection of the solar radiation reaching the surface of our planet. (See Figure 9.)

In 1997, Danish scientists H. Svensmark and E. Friis-Christensen noted that the changes in cloudiness measured by geostationary satellites perfectly coincide with the changes in the intensity of cosmic rays reaching the troposphere: The more intense the radiation, the more clouds.[52] Cosmic rays ionize air molecules, transforming them into condensation nuclei for water vapor, where the ice crystals—from which the clouds are created—are formed.

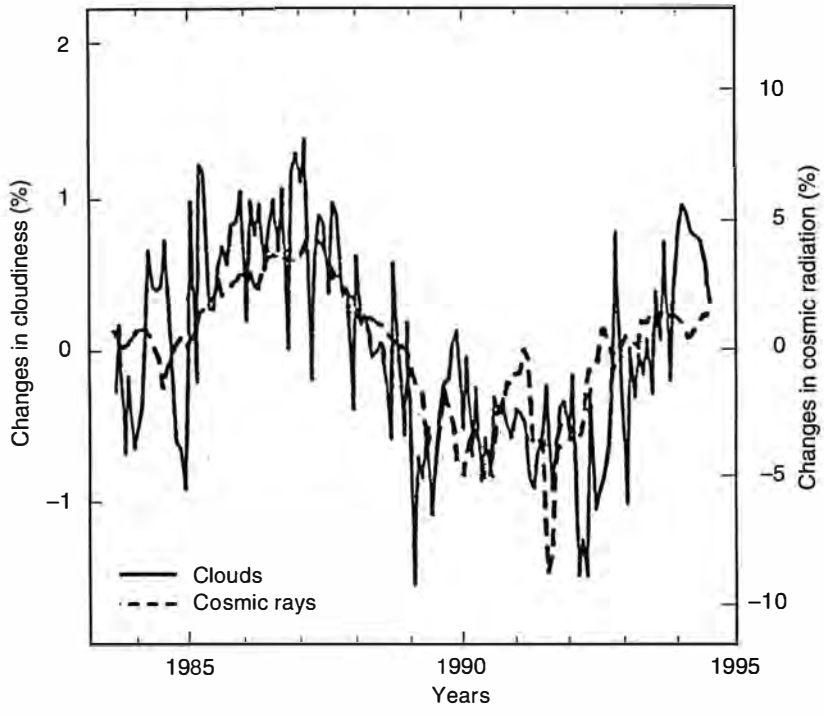


Figure 9
VARIATIONS IN COSMIC RAY INTENSITY AND CLOUD COVER (1984-1994)

Cosmic radiation comes to the Earth from the depths of the Universe, ionizing atoms and molecules in the troposphere, and thus enabling cloud formation. When the Sun's activity is stronger, the solar magnetic field drives a part of cosmic radiation away from the Earth, fewer clouds are formed in the troposphere, and the Earth becomes warmer.

The figure shows an astonishing coincidence between the changes in the cloud cap in the troposphere and the changes in cosmic radiation intensity in the period 1984-1994.

Source: N.D. Marsh and H. Svensmark, 2000. "Low Cloud Properties Influenced by Cosmic Rays," *Physical Review Letters*, Vol. 85, pp. 5004-5007

The quantity of cosmic radiation coming to the Earth from our galaxy and from deep space is controlled by changes in the so-called solar wind. It is created by hot plasma ejected from the solar corona to the distance of many solar diameters, carrying ionized particles and magnetic field lines. Solar wind, rushing toward the limits of the Solar System, drives galactic rays away from the Earth and makes them weaker. When the solar wind gets stronger, less cosmic radiation reaches us from space, not so many clouds are formed, and it gets warmer. When the solar wind abates, the Earth becomes cooler.

Thus, the Sun opens and closes a climate-controlling umbrella of clouds over our heads. Only in recent years have astrophysicists and physicists specializing in atmosphere research studied these phenomena and their mechanisms, in the attempt to understand them better. Perhaps, some day, we will learn to govern the clouds.

The climate is constantly changing. Alternate cycles of long cold periods and much shorter interglacial warm periods occur with some regularity. The typical length of climatic cycles in the last 2 million years was about 100,000 years, divided into 90,000 years for Ice Age periods and 10,000 years for the warm, interglacial ones. Within a given cycle, the difference in temperature between the cold and warm phases equals 3°C to 7°C. The present warm phase is probably drawing to an end—the average duration of such a phase has already been exceeded by 500 years. Transition periods between cold and warm climate phases are dramatically short: They last for only 50, 20, or even 1 to 2 years, and they appear with virtually no warning.

What Will Be the Earth's Fate?

It is difficult to predict the advent of the new Ice Age—the time when continental glaciers will start to cover Scandinavia, Central and Northern Europe, Asia, Canada, the United States, Chile, and Argentina with an ice layer hundreds and thou-

sands of meters thick; when mountain glaciers in the Himalayas, Andes, and Alps, in Africa and Indonesia, once again will descend into the valleys. Some climatologists claim that this will happen in 50 to 150 years.[53, 54]

What fate awaits the Baltic Sea, the lakes, the forests, animals, cities, nations, and the whole infrastructure of modern civilization? They will be swept away by the advancing ice and then covered by moraine hills. This disaster will be incomparably more calamitous than all the doomsday prophecies of the proponents of the man-made global warming hypothesis.

Similarly, as the study of Friis-Christensen and Lassen[50] shows, observations in Russia established a very high correlation between the average power of the solar activity cycles (of 10 years to 11.5 years duration) and the surface air temperature, and "leave little room for anthropogenic impact on the Earth's climate."[55] Bashkirtsev and Mashnich, Russian physicists from the Institute of Solar-Terrestrial Physics in Irkutsk, found that between 1882 and 2000, the temperature response of the atmospheric air lagged behind the sunspot cycles by approximately 3 years in Irkutsk, and by 2 years over the entire globe.[56] They found that the lowest temperatures in the early 1900s corresponded to the lowest solar activity, and that other temperature variations, until the end of the century, followed the fluctuations of solar activity.

The current sunspot cycle is weaker than the preceding cycles, and the next two cycles will be even weaker. Bashkirtsev and Mishnich expect that the minimum of the secular cycle of solar activity will occur between 2021 and 2026, which will result in the minimum global temperature of the surface air. The shift from warm to cool climate might have already started. The average annual air temperature in Irkutsk, which correlates well with the average annual global temperature of the surface air, reached its maximum of +2.3°C in 1997, and then began to drop to +1.2°C in 1998, to +0.7°C in 1999, and to +0.4°C in 2000. This prediction is in agreement with major changes observed currently in biota of Pacific Ocean, associated with an oscillating climate cycle of about 50 years' periodicity.[57]

The approaching new Ice Age poses a real challenge for mankind, much greater than all the other challenges in history. Before it comes—let's enjoy the warming, this benign gift from nature, and let's vigorously investigate the physics of clouds. F. Hoyle and C. Wickramasinghe[58] stated recently that "without some artificial means of giving positive feedback to the climate . . . an eventual drift into Ice Age conditions appears inevitable." These conditions "would render a large fraction of the world's major food-growing areas inoperable, and so would inevitably lead to the extinction of most of the present human population." According to Hoyle and Wickramasinghe, "those who have engaged in uncritical scaremongering over an enhanced greenhouse effect raising the Earth's temperature by a degree or two should be seen as both misguided and dangerous," for the problem of the present "is of a drift back into an Ice Age, not away from an Ice Age."

Will mankind be able to protect the biosphere against the next returning Ice Age? It depends on how much time we still have. I do not think that in the next 50 years we would acquire the knowledge and resources sufficient for governing climate on a global scale. Surely we shall not stop climate cooling by increasing industrial CO_2 emissions. Even with the doubling of CO_2 atmospheric levels, the increase in global surface air temperature would be trifling. However, it is unlikely that permanent doubling of the atmospheric CO_2, even using all our carbon resources, is attainable by human activities.[29] (See also Kondratyev, Reference 59.)

Also, it does not seem possible that we will ever gain influence over the Sun's activity. However, I think that in the next centuries we shall learn to control sea currents and clouds, and this could be sufficient to govern the climate of our planet.

The following "thought experiment" illustrates how valuable our civilization, and the very existence of man's intellect, is for the terrestrial biosphere. Mikhail Budyko, the leading Russian climatologist (now deceased), predicted in 1982 a future drastic CO_2 deficit in the atmosphere, and claimed that one of the next Ice Age periods could result in a freezing of the entire surface of the Earth, including the oceans. The only niches of life, he said, would survive on the active volcano edges.[60]

Budyko's hypothesis is still controversial, but 10 years later it was discovered that 700 million years ago, the Earth already underwent such a disaster, changing into "Snowball Earth," covered in white from Pole to Pole, with an average temperature of minus 40°C.[15]

However let's assume that Budyko has been right and that everything, to the very ocean bottom, will be frozen. Will mankind survive this? I think yes, it would. The present technology of nuclear power, based on the nuclear fission of uranium and thorium, would secure heat and electricity supplies for 5 billion people for about 10,000 years. At the same time, the stock of hydrogen in the ocean for future fusion-based reactors would suffice for 6 billion years. Our cities, industrial plants, food-producing greenhouses, our livestock, and also zoos and botanical gardens turned into greenhouses, could be heated virtually forever, and we could survive, together with many other organisms, on a planet that had turned into a gigantic glacier. I think, however, that such a "passive" solution would not fit the genius of our future descendants, and they would learn how to restore a warm climate for ourselves and for everything that lives on Earth.

Professor Zbigniew Jaworowski is the chairman of the Scientific Council of the Central Laboratory for Radiological Protection in Warsaw. In the winter of 1957-1958, he measured the concentration of CO_2 in the atmospheric air at Spitsbergen. During 1972 to 1991, he investigated the history of the pollution of the global atmosphere, measuring the dust preserved in 17 glaciers—in the Tatra Mountains in Poland, in the Arctic, Antarctic, Alaska, Norway, the Alps, the Himalayas, the Ruwenzori Mountains in Uganda, and the Peruvian Andes. He has published about 20 papers on climate, most of them concerning the CO_2 measurements in ice cores.

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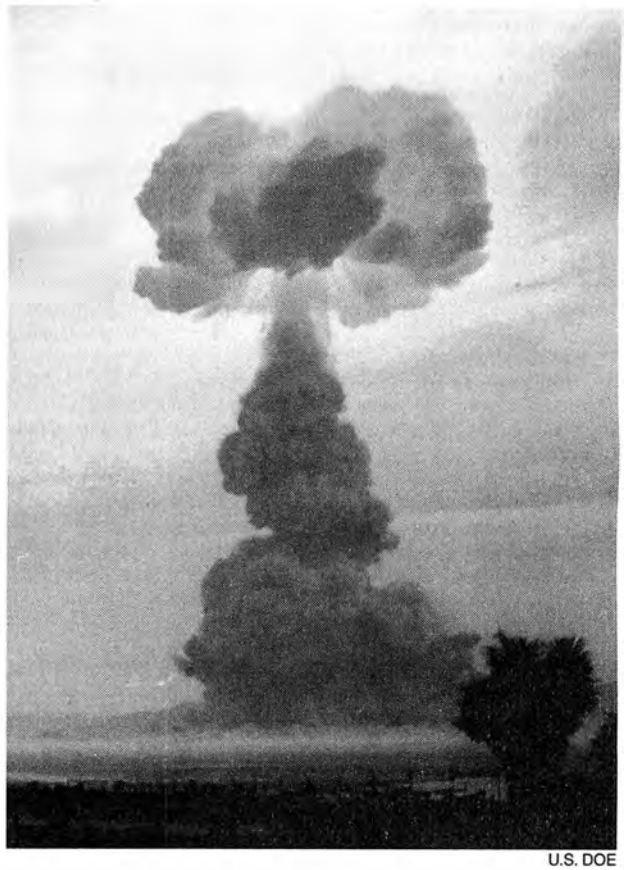
A 'Downwinder' Debunks The Myth Of Fallout Cancers

by Daniel W. Miles

I am a downwinder, one of many living "down wind" from the Nevada Test Site, and so are my seven brothers and three sisters. We were born and raised just two blocks north of the Mormon Temple in "Fallout City" (St. George, Utah) and more than 100 miles from the test site. I was 15 when the first atomic bomb was detonated in Nevada in 1951.

According to the best and most accurate data,[1] nearly 90 percent of the total St. George fallout exposure during the entire testing period (1951 to 1963) came from the 11 test shots in 1953—most of it from shot "Harry," detonated on May 19, 1953. During the summer of 1953, I, two brothers, and several neighbors played hours of basketball in our backyard. We played in dust so thick you could almost plow it and plant corn. All of us are still in good health, despite breathing some of shot Harry's debris.

This brings up the first of several downwinders' myths: that John Wayne was a victim of fallout from shot Harry (known as "Dirty Harry"). During an episode of the 1990s television show "Sneak Previews," Jeffrey Lyons and Michael Melved put the John Wayne movie, *The Conqueror,* on their list of the worst movies ever made. Then, Mr. Lyons said that *The Conqueror* had a sobering real-life aftermath: It was shot on location near a place polluted by fallout from Dirty Harry, and an alarming number of its cast (including John Wayne) were later stricken with cancer. It was the sensationalist author John G. Fuller[2] who first linked these cancers to fallout from Dirty Harry, and this charge has been echoed by almost every article, TV special, or book about the alleged plague of cancers blamed on radiation exposure from test fallout.



U.S. DOE

"Harry," the 32-kiloton nuclear bomb test fired May 19, 1953, at the Nevada Test Site. The author and his brothers and friends, who lived 100 miles away, played basketball that summer in the dust from the explosion.

Does the amount of the radiation absorbed by the cast and crew of *The Conqueror* justify linking their cancers to the residue from Dirty Harry? First, it should be noted that more than 99 percent of the 300 or so different fission products present in fallout have very short half-lives, and decay rapidly to non-radioactive atoms.[3] This is a very important fact, because filming of *The Conqueror* began in June of 1954—more than 380 days after shot Harry—and ended in late July that same year. "Dirty Harry" was detonated on May 19, 1953—the ninth of eleven test shots. Testing ended in early June of 1953, and did not resume until February of 1955.

According to health physicist Dr. Ray D. Lloyd, the total radiation dose to the cast and crew from the fallout of Dirty Harry was about 3 millirads.[4] Dr. Lloyd's estimate is based on well established decay rates,[3] which predict a 1,000-fold reduction in radiation intensity in 343 days after day 1, and on a study by H.L. Beck and A.W. Krey, which determined that the total external exposure at St. George over the entire above-ground Nevada testing period was 3,700 millirads.[5] (An intensive three-year study of the total external exposure at St. George by Lloyd et al. gives a slightly higher result of about 4,000 millirads.)[6] Hence, the locals who stayed in the area during the entire 12-year testing period received about a 3,700-millirad dose of radiation from Nevada Test Site fallout, but Wayne received less than one tenth of 1 percent of this amount—about 3 millirads.

For perspective, one should know that the radiation dose we all receive from natural background radiation is about 300 millirads *every single year*—most of it from the air we breathe, which contains radioactive radon gas.

Therefore, during the year of 1954, John Wayne, who died of lung cancer 25 years later, received at least 100 times more radiation from Mother Nature than from Dirty Harry. And, he received additional radiation from his cigarettes. Wayne smoked more than four packs of unfiltered cigarettes

daily, and the tobacco plant concentrates radioactive polonium (from phosphate fertilizers) in its leaves. In addition, tobacco smoke itself contains carcinogens.

Some will say that we have overstated our case because, as author Fuller ominously tells his readers, "The plutonium levels in Utah were 3.8 times higher than anywhere else in the country."[7] After stating this "fact," Fuller links Wayne's lung cancer to inhaled plutonium. Plutonium has a half-life of about 25,000 years, which means that more than 99.9 percent of Dirty Harry's deposited plutonium was still around when *The Conqueror* was being filmed. As usual, Fuller gives no source for this "fact," but I did find the following in a letter written by Governor Matheson of Utah and sent to several different officials of the Carter Administration: "The 1974 study determined that the levels of plutonium in the Utah soils were up to 3.8 times that of anywhere else in the United States."[8]

Here are the actual facts from the 1974 study by E.P. Hardy of plutonium levels in Utah.[9] The *highest* reading was obtained on a soil sample taken near Provo, Utah—a reading 3.8 times higher than the *lowest* readings found in samples elsewhere in the United States. The plutonium level from the Nevada Test Site fallout near St. George was less than one-third of that found near Provo. But of vastly greater importance, is the fact that plutonium's contribution to fallout's total radioactivity in 1974 Utah soil was, according to Hardy's data, wholly negligible—about one-half of 1 percent.[9] Therefore, plutonium added less than 0.015 millirads (0.005 × 3.0) to the approximately 300 millirads of natural radiation absorbed by John Wayne during the year 1954, and the same plutonium has contributed essentially the same puny dose year after year to the St. George residents. So don't expect a belated surge of lung cancers among the downwinders, even those downwinders breathing dust while playing endless hours of basketball. Potboilers like Fuller are a crafty bunch—they know that there is one falsehood more powerful than the outright lie: a partial truth.

The main conclusion from the scientific analyses is: By the time *The Conqueror* was being filmed, the local harmful radiation was overwhelmingly a result of *natural* radioactive atoms, not the bomb test. Thus, John Wayne would have died of lung cancer even if the filming had been done in the Gobi desert or Timbuktu. Blaming "Dirty Harry" for Wayne's lung cancer is like blaming skin cancer on moonlight instead of sunlight. Sadly, dull truths are no match for exciting myths.

Courtesy of Daniel W. Miles

The site north of St. George, Utah, where John Wayne's film "The Conquerer" was shot in 1954. Despite claims that Wayne's cancer 25 years later was the result of fallout, in fact, Wayne received only a minuscule amount of radiation from the site—about one one-hundredth of the 300 millirads of natural background radiation received per year.

Wallowing in Cold War Myths

The second downwinder myth is that the bulk of the fallout from aboveground nuclear tests was dumped on southern Utah (Washington County, Iron County, and Kane County). Oh, how some of the locals love to wallow in this myth—their proof that the Cold Warriors were more than willing to offer up the locals as sacrificial lambs. The 14-year study by the National Cancer Institute, released in 1997, debunks this myth.[10] Eight counties in Montana and four counties in Idaho actually suffered greater overall fallout doses than Utah's hardest hit area (the St. George area).

According to this study, Meagher County in Montana received 50 percent more fallout than Utah's St. George area; 10 times more fallout than Iron County, and 3 times more fallout than Kane County. The National Cancer Institute results show that every county in Idaho, Montana, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Missouri, and Iowa received more fallout than Iron County. So did all counties in Illinois except one, and so did many counties in most other states.

Many of the fallout clouds bypassed southwestern Utah entirely; some went up the Nevada-Utah border and then to northern Utah, or parts of Idaho, Montana, and Wyoming. Others went southwest into Arizona, and a few even went westward towards California, before swinging eastward. For example the Buster: Baker 1951 cloud crossed over the California coast and spent several days over the Pacific before returning inland over San Diego. Much of Buster: Baker's debris would later fall to Earth as radioactive rain near Lexington, Massachusetts.[11] Most of the debris from the 1951 Ranger: Able and Ranger: Baker shots fell on the East Coast.[11]

The National Cancer Institute results suggest that the downwinder population should be expanded to include most residents living between Nevada and the Atlantic Ocean. This should scare the hell out of the U.S. government, because it opens the floodgates to compensation seekers. Under the Radiation Exposure Compensation Act, passed by Congress in 1990, compensation is currently limited to uranium miners, test site workers, and the immediate downwind population living in sparsely populated southern Utah, east-

ern Nevada, and northern Arizona. Opening up the Compensation Act to include those 50 million or so American cancer victims since the first test shot in 1951 would cost the government several trillion dollars.

What Cancer Epidemic?

The third myth is a gigantic one. Over and over again, the main newspapers in the fallout area (*The Spectrum, The Deseret News, The Salt Lake Tribune*) and most of the national print and electronic media, have hyped the myth of a cancer epidemic among the population of southwestern Utah as a result of fallout from nuclear detonations at the Nevada Test Site. And so have the potboilers. The books and articles by the fallout potboilers, selectively used information that supported predetermined conclusions, and relied heavily on anecdotal reports, undocumented "facts," and epidemiological studies that were preliminary in design or flawed in concept. One widely referenced study by these authors was conducted by an amateur epidemiologist using untrained volunteers!

There was a marked tendency by the potboilers to ignore later studies, to pooh-pooh them, or to question the scientific integrity of the researchers involved, even though the later studies, which gave evidence of a far weaker or nonexistent cancer-fallout association, were better designed, more focussed, more exhaustive, and better executed.

The readers of *21st Century* are well aware of the sensationalist media coverage of radiation and nuclear power issues that has long hindered accurate communication of radiation risk to the public. The *21st Century* readers will not be surprised that the hyped fallout-induced cancer epidemic is not supported by careful epidemiological studies. The term "careful" is used advisedly, because the myth is seemingly supported by two studies[12,13] reporting excess cancer, primarily leukemia, in the high-fallout area. The study by J.L. Lyons et al.[12] exercised appropriate caution in interpreting results, but the press and potboilers were far less careful. A careful examination of the Lyon report reveals that, instead of establishing the possibility of an association between low-level radiation and leukemia, there is instead evidence that radiation *prevents* childhood cancers. The data generated by the Lyon report actually support the possibility that low-level radiation prevents cancer—a possibility amply supported by recent articles in *21st Century*.[14,15]

This possibility, unthinkable in today's media-induced hysterical fear of even a single millirad of radiation exposure, was described by Dr. Charles E. Land in the same issue of *The New England Journal of Medicine* where the Lyon report appeared.[16] The death rate for all childhood cancers in the Lyon study were *lower* for the "exposed" group in the "high-exposure" area than for the groups in the lower exposure areas.

A few years later, Land et al. reexamined the radiation-leukemia association, using the National Center for Health statistics for 1950 to 1978, and concluded that there was no pattern of excess leukemia mortality that supported a causal association with fallout exposure, and that the excess reported by Lyon reflects an abnormally low rate in southern Utah during the pre-exposure period, 1944 to 1949.[17] H.L. Beck and A.W. Krey came to a similar conclusion, based on their findings that radiation doses received by the southern Utahans were much too low to produce excess leukemias: "It seems unlikely that the excess leukemias observed by Lyon resulted from exposure to the Nevada Test Site fallout."[8]

An exhaustive three-year epidemiological study of three southwestern Utah counties, Washington, Iron, and Kane, by the National Cancer Institute, found no increase in cancer risk that might be attributable to fallout, with the possible exception of leukemia.[18] According to this study, which covered the 16 years prior to 1980, the relative cancer risk in these counties was less than that for their counterparts elsewhere in Utah. The per year cancer death rate, averaged over the 16 years, was 113 per 100,000 for the exposed counties, compared to 122 per 100,000 for the rest of the state. The U.S. yearly rate over the same time period was 166 per 100,000.[18]

More recent studies also reject the Lyon study. A 1990 case-control study found a weak but not statistically significant association between bone marrow dose and all types of leukemia.[19] And Dr. Ray D. Lloyd concluded from his study[1] on fallout-induced leukemia in Washington County that ". . . the effect of Nevada Test Site fallout exposure was small if not entirely absent. . . ." He further concluded that if, essentially, no leukemias were induced among the Washington County population by fallout, then virtually no other cancers were induced.

E.S. Weiss[20] and later M.L. Rallison and coworkers[21,22] conducted a large clinical study of thyroid disease in downwind children, beginning in 1965. A group consisting of children of Graham County, Arizona, which was essentially free of fallout, was selected as the control group. The two cases of thyroid cancer detected in the study were both in unexposed children. Thyroid abnormalities were distributed evenly between the exposed and unexposed children.

John G. Fuller ignored all these published results in his book *The Day We Bombed Utah.* Instead, in his patented style of building a case from half-truths, preliminary studies, and undocumented facts,[23] Fuller notes that 40 school children in the St. George area had indications of thyroid problems, and then writes: "The non-fallout control area of Graham County, Arizona, showed a marked contrast. There were only eight cases."[24] Fuller's source for this was very preliminary, and the never-published data obtained by E.S. Weiss. Weiss's published results,[20] which were ignored by Fuller, determined that there was no difference in the incidence of thyroid disease between the exposed and unexposed children. Similarly, two other one-sided treatments of the health effects of radioactive fallout from weapons testing trumpeted Weiss's preliminary results, but not his published results.[11,25]

A more recent study[26] of thyroid disease among 3,545 subjects, who had been children living in southwestern Utah during the atmospheric testing period, concluded that there was no statistically significant association between exposure from fallout residues and thyroid cancer. Early estimates of radiation doses from radio-iodine in milk to the thyroids of St. George children were as high as 120 rads—a number that fallout alarmists persist in reporting.[24,25]

Dr. Ralph E. Lapp, who is a well known expert on radiation protection and the author or co-author of numerous articles and 22 books on biological effects of ionizing radiation, has summa-

Courtesy of Daniel W. Miles

"Fallout City": St. George, Utah, looking south toward the Mormon Temple. The main fallout effect is radiation phobia.

rized the Utah situation thusly: "Epidemiologic studies on the Utah residents have disclosed no increase in cancer risk that might be attributable to fallout. Health survey data in Utah do not indicate an association between childhood leukemia and residence downwind from the test site."[27] It should be noted that Lapp, a nuclear physicist, was an early critic of the Atomic Energy Commission's safety measures during weapon testing.

The 1984 study by amateur epidemiologist Carl Johnson[13] relied on data gathered by untrained volunteers making phone calls using the 1961 telephone directories for towns in southwestern Utah and neighboring parts of Nevada and Arizona. By the time Johnson began his study, many southwestern Utahan were sure they were doomed. (The real health effects of media-induced psychological stress on downwinders has never been assessed.) In this atmosphere of panic, an overreporting of incident cancer cases would be expected. Moreover, self-reports of diseases is hardly state-of-the-art epidemiology; these cancers were not medically confirmed. Carl Johnson was, after all, not a professional epidemiologist, yet his work is much more widely referenced than the far more credible Machado et al. analysis of cancer rates cited above.[18] The results of the two studies could hardly be more contradictory. Johnson reported a 4,500 percent increase in leukemia (doses of hundreds of rads would be require to produce this increase).

Finally, I wish to note that only a potboiler builds a whole case around a few preliminary epidemiological studies. Competent epidemiologists exert great restraint when dealing with rare disease rates; they know that rare diseases such as leukemia will experience greater fluctuations by chance alone, over a short period of time, than will more common diseases. Rates are averages—averaged over time and over large populations—that can vary widely over short time periods and small populations. Right now, by chance alone some localities are experiencing higher than normal leukemia rates, even several times higher. If you can find one of these localities, and find an offending pollutant nearby, presto, you have the makings of a new potboiler. Its really just that simple.

Not a few of the local downwinders tend to believe that southwestern Utah was a cancer-free zone before the testing began, and that every cancer case since is the result of fallout. This belief is not limited to cancer—almost every human ailment suffered by some of our locals is blamed on fallout. Of course, we will never know whether or not the fallout over southwestern Utah or the rest of America caused extra cases of cancer which are lost in normal cancer rates, but we do know there was no cancer epidemic in southwestern Utah.

What is remarkable is how radiation hysteria made strange bedfellows—the conservative, putative victims of fallout in southern Utah and the radical antinuclear lobby. Talk about strange bedfellows—conservative Senator Orrin Hatch, a Utah Republican, and a host of liberal senators are promoting a multi-million-dollar giveaway to local cancer victims. The nation's taxpayers should be outraged; they get cancer at a greater frequency than the people of southwestern Utah. Perhaps the rest of the nation's population should be hiring lawyers to demand their millions because the government did *not* expose them to a cancer-preventing dose of radiation.

The downwinders' myths, like radiation phobia generally, are supported by the hysterical and untruthful ways in which radiation and nuclear energy are depicted in the media. The media has little interest in combatting downwinders' myths or myths about Three Mile Island, Chernobyl, Hanford, Rocky Flats, Savannah River, Oak Ridge, Fernald, Detroit, or radiation effects in general. The media and potboilers tend to ignore pro-nuclear experts and recruit their "experts" from non-nuclear disciplines, or from ex-scientist like Ernest Sternglass (of fallout-caused-falling-SAT-scores fame), Arthur R. Tamplin, and John W. Gofman. The media love "experts" who use unrestrained language, exaggerated estimates, and wild predictions, which help fuel public concern and hype ratings and book sales. Gofman, for example, in the case of "Irene Allen v. The United States of America," arrived at probabilities exceeding 50 percent that the plaintiffs' cancers were caused by fallout.[28] Gofman based his figures on the very high estimates of exposure from an amateur epidemiologist—the aforementioned Carl Johnson.

Radiation phobia, a culturally mediated reflex, is going to persist for a long, long time, and so are the downwinders' myths. Let's hope that the LaRouche Youth Movement, based on a respect for truth and science, can change this unfounded fear—and the media that spreads it.

Dr. Daniel Miles, a former physics teacher, is now Professor Emeritus at Dixie State College in Utah.

Notes

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2. John G. Fuller, 1984. *The Day We Bombed Utah: America's Most Lethal Secret*, pp. 101-105, 205, 236. (New York: New American Library). Fuller is the author of *We Almost Lost Detroit* and *The Poison That Fell from the Sky*, both flagrantly false accounts. Fuller paints each "disaster" with great poignancy, but his works are worthless as documented non-fictional studies.
3. S. Glasstone and P.J. Dolan, 1977. *The Effects of Nuclear Weapons*, Revised Edition, Department of the Army Pamphlet, pp. 390-391. ". . .[F]or every sevenfold increase in time after the explosion, the dose rate decreases by a factor of 10. . . . [A]t the end of 1 week, the radiation dose rate will be about one-tenth of the value after 1 day." Hence, after 343 days ($7 \times 7 \times 7 = 343$), the dose rate will be one-thousandth of that at I day after the burst.
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5. H.L. Beck, A.W. Krey, 1983. "Radiation Exposures in Utah from Nevada Nuclear Test," *Science*, Vol. 220, pp. 18-24.
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7. John G. Fuller, 1984. *Op. cit.*, pp. 204-205.
8. *Health Effects of Low-Level Radiation*, Joint Hearings, 96th Congress, 1st Session, April 1979, pp. 2365 (U.S. Government Printing Office, Washington, D.C.)
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22. M.L. Rallison, B.M. Dobyns, F.R. Keating, et al. 1975. "Thyroid Nodularity in Children," *JAMA*, vol. 233, pp. 1069-1072.
23. See J.G. Fuller, *op. cit.*, p. 93 for the following typical undocumented fact: "No one had yet reported that the fallout at St. George from Dirty Harry had reached 1,230 times the permissible limit, and had stayed that way for 16 days." What nonsense! The fallout cloud did not linger over St. George; it passed over the Iowa-Illinois border just one day later. And, of course, radiation intensity from deposited fallout decreases very rapidly with time.
24. J.G. Fuller, *op. cit.*, p. 172.
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21st CENTURY SCIENCE & TECHNOLOGY

- James Muckerheide, "It's Time to Tell the Truth about the Health Benefits of Low-Dose Radiation," Summer 2000
- Dr. Theodore Rockwell, "Radiation Protection Policy: A Primer," Summer 1999

The current U.S. policy of a "linear no-threshold" approach to radiation damage has no science behind it.

- Zbigniew Jaworowski, "A Realistic Assessment of Chernobyl's Health Effects," Spring 1998
- Jim Muckerheide and Ted Rockwell, "The Hazards of U.S. Policy on Low-level Radiation," Fall 1997

Radiation experts argue that current U.S. policy of a "linear no-threshold" approach to radiation damage has no science behind it and is wasting billions of government dollars in clean-up that could be spent on real health benefits.

- Sadao Hattori (interview), "Using Low-dose Radiation for Cancer Suppression and Revitalization," Summer 1997

A discussion of Japan's wide-ranging program of research into the health effects of low-dose radiation.

ARTICLES ON RADIATION and HORMESIS

- T.D. Luckey, "The Evidence for Radiation Hormesis," Fall 1996

A comprehensive review of the evidence of the beneficial effects on health of low-dose radiation.

- Zbigniew Jaworowski, "Hormesis: The Beneficial Effects of Radiation," Fall 1994

In 1994, the United Nations Scientific Committee on the Effects of Atomic Radiation, after 12 years of deliberation, published a report on radiation hormesis, dispelling the notion that even the smallest dose of radiation is harmful.

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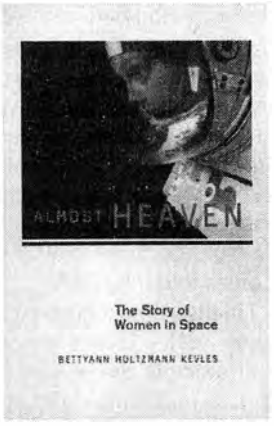
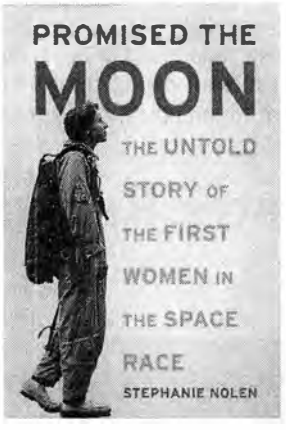
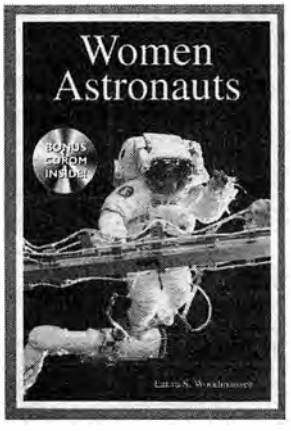
Promised the Moon: The Untold Story of the First Women in the Space Race
by Stephanie Nolen
New York: Four Walls Eight Windows, 2002
Hardcover, 356 pp., $22.95

Almost Heaven: The Story of Women in Space
by Bettyann Holtzmann Kevles
New York: Basic Books, 2003
Hardcover, 256 pp., $25.95

Women Astronauts
by Laura S. Woodmansee
Burlington, Ontario, Canada: Apogee Books, 2002
Paperback, 168 pp., CD-Rom, $21.95







Forty years ago, on June 16, 1963, Russian parachutist Valentina Tereshkova stepped into her Vostok 6 space capsule, and into the history books, as the first woman in space. It was only 20 years later that Sally Ride became the first American woman in space. Why did it take two decades for the Americans to match the Russians in this milestone in space accomplishments?

There are many answers to this question. One, is indicated by the fact that the Russians did not launch a second female cosmonaut for nearly two decades—Tereshkova's flight was not part of an "equal-opportunity" Communist space program, but a publicity-getter, in its Cold War competition with the United States. In fact, even after Tereshkova's mission, neither Russian nor American space officials believed a woman's place was behind the controls of a spacecraft.

Sally Ride's flight in 1983 was national news, as Tereshkova's had been. But there is a story that is much less well known. For 13 women, the 1995 flight by Air Force Lt. Col. Eileen Collins was more important than Sally Ride's flight, because Collins was not just a passenger aboard the Space Shuttle—she was the pilot. The group of 13 women had secretly tested as astronaut candidates, at the same time as the world-famous Mercury Seven men in the early 1960s. But they never flew.

These three books comprise the history of the past, present, and future of women astronauts in the American space program—those who trained but never flew, those who have flown, and those whose opportunity to fly is yet to come.

The 1960s FLATs

Reading through the biographical sketches of the first 13 women to go through astronaut testing, described in *Promised the Moon,* and comparing them to the post-1978 women astronauts, who *have* flown in space, described in *Almost Heaven,* it is obvious that there is no stereotypical female astronaut.

It was not long after the Wright Brothers made their first historical flight (the 100th anniversary of which we celebrate this year), that women took to the skies. And by World War II, women were flying freight, crop-dusting, and corporate planes, and ferrying military aircraft from the manufacturer to the military pilots who would fly them into battle. They entered competitions, and achieved world records for distance, altitude, and speed, sometimes beating the records set by men. Names such as Jerrie Cobb, Jackie Cochran, and Amelia Earhart, became household words.

In 1959, America was looking for astronauts for the new manned space program. Here was a chance, the most adventurous women thought, to meet the next challenge, and fly farther and faster than they had ever dreamed.

At that time, Randolph Lovelace II, chairman of NASA's Life Sciences Committee, and head of the Lovelace Clinic in Albuquerque, New Mexico (and a pilot as well as a medical doctor), was asked to take charge of the medical screening of astronaut candidates.

Meanwhile, the engineers who were designing the mission for the first man in space knew that the capsule to carry him would be limited by the relatively small rockets they would have to work with. Female astronaut-pilots would be smaller and lighter, use less oxygen, food, and water, and, therefore, would be easier to launch, Lovelace and his colleagues suspected.

In addition, previous studies had proven that women were more tolerant of pain, heat, cold, and isolation. Lovelace and others working with him believed it was a "logical step," that women also be tested for "survival in space."

World-famous aviatrix Jerrie Cobb was the first to undergo the grueling series of physical exams and endurance tests that the male Mercury astronaut candidates suffered through, and she passed with flying colors. Twelve other women followed her. So was born the Fellow Lady Astronaut Trainees, or FLATs.

But Randy Lovelace never promised the women trainees that NASA would accept female astronauts. He may have been a bioastronautics pioneer, but he was not a political mover and shaker.

A Woman's Place

Nolen's book brings back to the reader what the reality was for women in the 1950s—before the Civil Rights legislation of the Kennedy/Johnson years, and before equal rights for women was national policy.

A woman's place, especially after the "lean years" of World War II, was at home having children. Women in "mens' jobs," like flying airplanes, were looked at askance, and gossips wondered if they were just tomboys or were lesbians. And imagine the outrage if a mother were lost in an accident in space!

NASA never flew the FLATs. The banality of the cultural matrix of the 1950s defined women "by a domestic role, as wives and mothers and consumers whose lives in new suburban tract houses embodied the American dream," Nolen states. But the FLATs were the pioneers.

"We're very grateful, because now we have a future," the Fellow Lady Astronaut Trainees told Lt. Col. Eileen Collins shortly before she became the first woman to pilot a Space Shuttle. "I'm very grateful, because now I have a past," Collins told the FLATs.

Finally, Almost Heaven

Bettyann Kevles brings the story of women in space to the present, by providing details of the lives of the extraordinary women chosen in 1978 in NASA's first astronaut class to include females.

Even more so than the FLATs—who were both rich and poor, rural and urban, political firebrands and shy and retiring—NASA's first women astronauts included those who had wanted to go into space since childhood, and those who had never thought about it until the opportunity arose. Each has her own story, and the variety among them is interesting, and inspiring. The first women astronauts did not fly the vehicle, but were mission or payload specialists, who had responsibilities for either scientific experiments or a specific function or piece of equipment on their mission.

Some of the women flew only once; others made it their career. And, as one sign of the cultural change from the 1950s, three woman astronauts, and one elementary school teacher, died in the Challenger and Columbia Space Shuttle accidents, but no one has called for women to be excluded from the Space Shuttle program.

Apogee's *Women Astronauts* allows the reader to meet these special women, virtually in person, with the inclusion of a CD-Rom containing video interviews with eight women astronauts, including Eileen Collins.

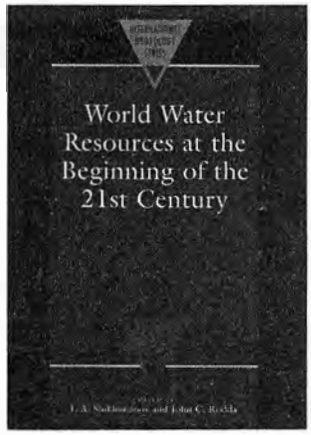
A Truthful Book on Water Resources

by Marcia Merry Baker

World Water Resources at the Beginning of the 21st Century
Editors: I.A. Shiklomanov and John C. Rodda
New York: Cambridge University Press, 2003
Hardcover, 435 pp., $150

It is not usual to review a physical science reference text, but this new release deserves special mention. Edited by I.A. Shiklomanov of the State Hydrological Institute of the Russian Federation, and by John C. Rodda, Past President of the International Association of Hydrological Sciences, Centre for Ecology and Hydrology, Wallingford, Oxford, the book is copyrighted by UNESCO.

The monograph is valuable because it has, all in one place, the most recent data on world fresh-water resources—by continent, by country, and with analysis. Its main usefulness comes from the openness of its premises regarding what it



calls, the "anthropogenic" impact on rivers and lakes. Academician Shiklomanov states in his introduction, "For the first time in history the availability of water resources and their distribution in space and time has begun to be determined by human activity, in addition to the natural variations in climate."

Therefore, the point is implicitly posed, in the regional summaries throughout the book, that mankind's intervention can and must be made, using technology, to increase "natural" resources.

In the case of North America, the author of this section, A.Z. Ismailova, reviews the large-scale water transfer projects that were proposed decades ago—the North American Water and Power Alliance (NAWAPA), the CeNAWP (Central American Water Project), and the GRAND Canal (Grand Recycling and Northern Development) Project. But, as the book notes, as of the 1970s, this kind of outlook was abandoned. The truthful identification of such a shift, and other features of the study, recommend it.

Marcia Merry Baker is the Economics Editor of Executive Intelligence Review.

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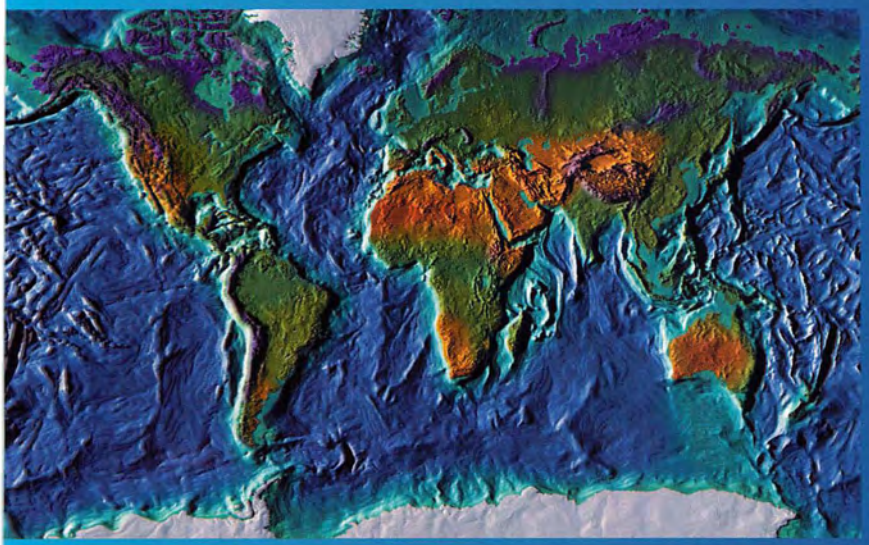

Science and Our Future: Ideas to Change The World

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Dear Colleagues:

In the course of the last century, fundamental scientific research gained an increasingly dominant influence on human affairs, changing the course of history. The crucial technological revolutions of the 20th Century, such as aviation and space exploration, nuclear energy, lasers, and microelectronics, have been intimately bound up with fundamental progress in science. Without any doubt, the impact of fundamental research on the development of human society will continue to grow over the coming decades.

History provides many examples of discoveries that were at first rejected, ignored, underestimated, or even suppressed, but without which modern life would hardly be imaginable today. In our times, the task of gauging new ideas has become more complicated, owing to a whole range of factors, such as:

- The tendency toward narrow specialization in science, in contrast to the wide scope of knowledge and thinking, needed to appreciate the significance of revolutionary new ideas.
- The growth of "informational noise," including prejudiced and misleading information, as a result of which important ideas tend increasingly to be overlooked.
- The growth of influence of commercial special interests, supplanting the interests of society as a whole, and lobbying for ideas that are often not the best.

This international conference is devoted to searching out and propagating scientific ideas, which have thus far been either overlooked or insufficiently recognized, but which have the potential to significantly change the future of humanity. A high priority of the conference organizers is to attract participation from the new, young generation of students and scientists, who will play a decisive role in building our future.

In the past, the generation and transmission of power, and the production and use of materials and natural resources, have been two key areas, through which fundamental scientific breakthroughs have transformed the life of society. No doubt they will continue to play a decisive role in the 21st Century. Accordingly, the Program Committee will give priority attention, in the selection of papers, to these two main areas.

Call for Papers

In accordance with the goals of the conference, papers for presentation must contain proven scientific ideas, whose elaboration and application can have a significant impact on the future of mankind.

Abstracts in electronic or printed form should be submitted to the Organizing Committee of the Conference by no later than December 31, 2003. Expanded summaries of presentations will be published in a conference volume (in book form as well as compact disc). The length of the written summaries should be limited to approximately 8,000 characters and 3 diagrams. After consideration by the Program Committee, but no later than March 1, 2004, the Organizing Committee will inform authors concerning the acceptance of papers for publication, invitations for participation in the conference, and honoraria. Selected presentations will be published in full length in Russia, USA, France and Germany. Participants, whose papers are not chosen for oral presentation, have the option to present them as poster papers. Papers can be submitted in both Russian and English.

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In This Issue

Science and the YOUTH MOVEMENT

HOW TO WIN GAUSS AND INFLUENCE HISTORY

The mastery of Carl Friedrich Gauss's 1799 proof of the Fundamental Theorem of Algebra (and refutation of Euler, Lagrange, and d'Alembert's hoaxes) is a central theme of the educational work of the LaRouche Youth Movement. In "How to Win Gauss and Influence History," youth movement leader Peter Martinson describes his very personal struggle to master and teach Gauss's discovery.

Peter Martinson, points to an icosahedron inscribed in a dodecahedron, in a pedagogical class for the LaRouche Youth Movement in Seattle.

THE PAGAN WORSHIP OF ISAAC NEWTON

A population capable of making scientific discoveries and improving the well-being of mankind, has to be free from the cult of empiricism, which makes no distinction between man and beast, and hence denies the concept of the human mind. Lyndon H. LaRouche, Jr. describes the creation and spread of the cult of Newtonianism in the historical context of the oligarchical mission to stop the advances of the 15th Century Renaissance.

Newton's ornate grave and memorial in Westminster Abbey, London, has its counterpart in the elaborate edifice of empiricism that permeates the sciences today. The memorial dates from 1731.

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