MARTIN GARDNER ON SOKAL HOAX • NOT-SO-SPONTANEOUS HUMAN COMBUSTION • EVOLUTION BATTLES

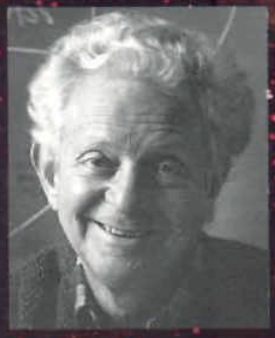
Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

Volume 20, No. 6 • **November/December 1996**

A Strategy for Saving Science

Leon M. Lederman



Cosmic Menagerie

Neil deGrasse Tyson

That's Entertainment! TV's UFO Coverup

Philip J. Klass

Scientific Consensus and Expert Testimony

The Dogon Revisited

The 'Roswell Fragment'—Case Closed

Published by the Committee for the Scientific Investigation of Claims of the Paranormal

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AT THE CENTER FOR INQUIRY (ADJACENT TO THE STATE UNIVERSITY OF NEW YORK AT BUFFALO)

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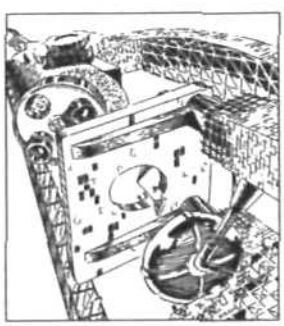
NEIL DEGRASSE TYSON



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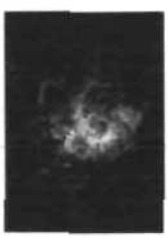
Hubble Space Telescope photo of the vast nebula NGC 604. Hui Yang (University of Illinois), Jeff J. Hester (University of Arizona) and NASA Ground-based image courtesy of Palomar Observatory, Caltech and the STScI Digitized Sky Survey.



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EDITOR'S NOTE

Saving Science and Searching for Aliens

With his twinkly smile and ready wit, Leon Lederman might not be your stereotypical expectation of a Nobel laureate physicist. He speaks and writes with zest, informality, and irreverence. His book *The God Particle* is a surprising and entertaining tour of current topics in modern physics. He devotes much of his time these days to issues of science education and scientific literacy. At CSICOP's twentieth-anniversary conference Lederman delivered a lively, informal trademark address on all manner of threats to science, from funding cuts to anti-science attitudes among intelligentsia, to the dismal scientific illiteracy among our public today. He also offered constructive suggestions and programs for stimulating young people's interest in science, improving science education, and creating better informed citizens. His article "A Strategy for Saving Science," in this issue, is based on that talk.

* * *

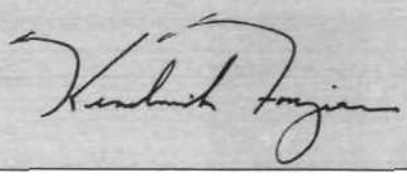
Philip J. Klass has no peers for the title of world's leading UFO skeptic. A tireless investigator, this veteran of some four decades at *Aviation Week & Space Technology* magazine and head of CSICOP's UFO subcommittee for its two decades, has looked in vain for some solid evidence of UFOs as extraterrestrial spacecraft. In his article in this issue, also based on a talk at the CSICOP conference, Klass shows that there is indeed a coverup in regard to what the public is told about the supposed Roswell crashed flying saucer of 1947. That coverup is being carried out by the nation's television networks. Klass has on several occasions provided them documentary proof in the form of once top-secret documents that disprove the Roswell myth. These documents show that in late 1948 top Pentagon intelligence officials thought UFOs may have been of Soviet origin. No alien spacecraft, let alone "aliens," were known. Will the networks tell the public?

* * *

Two other items on the Roswell incident, in our News and Comment section, show how shoddy this whole mess has become. The one of most significance concerns an unusual looking fragment of metal that surfaced this spring. It was alleged to be from the Roswell "crashed saucer." Legitimate scientists have now subjected the metal to isotopic analysis. As David E. Thomas reports, the results show that its origin is Earthly. Then in early September the fragment's origin was pinpointed a little more closely. An artist in St. George, Utah, made it. To his credit, the artist had never represented the material as anything other than leftover scraps from his own line of jewelry. But someone else certainly did.

* * *

The NASA announcement that U.S. scientists have detected in a Martian meteorite what may be microfossil evidence of past life on Mars is—in contrast to all the bogus "alien" allegations—legitimately exciting. Good scientists have found and presented good evidence in appropriate forums, including publication of their data and microphotos in the journal *Science.* They agonized over how and when to announce their findings and conclusions, and they provided all necessary caveats. They invited further scrutiny. We will eventually see how this all comes out, but the excitement in both the scientific community and the media was appropriate. If the discovery is confirmed, it is epic.



Skeptical Inquirer

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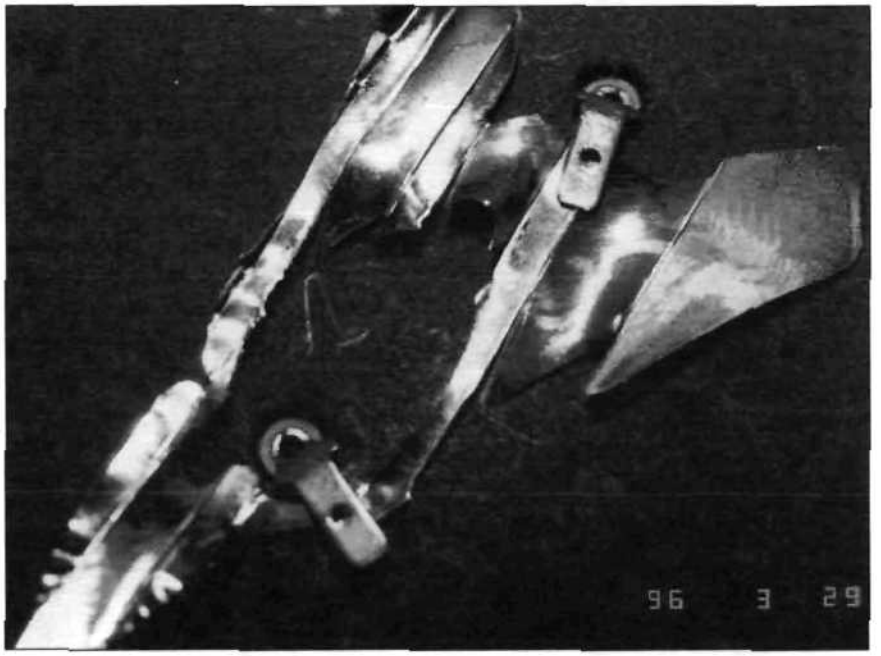
The 'Roswell Fragment'—Case Closed

It was said to have come from outer space. On Sunday, March 24, 1996, a small piece of strange, swirly-patterned metal was delivered to the Roswell International UFO Museum and Research Center in Roswell, New Mexico. The man who turned in the fragment of metal to the museum, Blake Larsen, had been told it was retrieved from the 1947 crash of an alien craft near Roswell. But on Friday, September 6, it was revealed that the fragment wasn't made on another planet—it came from St. George, Utah. Here is the story of the fragment that has gained international attention for the last six months.



The fragment during testing at the Bureau of Mines in Socorro, New Mexico. Isotopic analyses reveal its origin is Earthly, and an artist confirms he made it. Photo by C. B. Moore.

Shortly after receiving the piece of metal, the museum announced plans to have it scientifically tested. Museum official Max Littell said, "If some metallurgist says there is nothing in the book like this, and he has got all his degrees and is an expert source, then we are home free. This is it."

When I heard of the fragment on local television, I promptly contacted C. B. Moore, professor emeritus of physics at New Mexico Tech. Back in 1947, Moore launched the balloon train now widely thought to have precipitated the actual "Roswell Incident" (SKEPTICAL INQUIRER, July/August 1995). Moore then spoke with Museum Board member Miller Johnson and was invited to join in the first inspection of the fragment, scheduled for the following day (March 29), at the Bureau of Mines at New Mexico Tech in Socorro. Department manager Chris McKee carried out the analysis, while Roswell police chief Ray Mounts recorded the procedure. The results of the X-ray fluorescence measurements indicated the metal was about 50% Cu (copper) and 50% Ag (silver) on the front side, and 87% Ag and 12% Cu on the back side, with 1% other trace elements.

At about that time, I came across a statement by astronomer Carl Sagan in the March/April 1996 SKEPTICAL INQUIRER regarding testing of purported alien artifacts such as implants. Sagan noted that none had been observed to have unusual isotopic content. I did a little research and found that most isotopes of copper decay quickly, but two are stable: Cu-63 and Cu-65. No matter where copper is found on Earth, it always consists of the same percentages of these isotopes. But heavy elements like copper are forged by a variety of thermonuclear events in red giants or supernovae, and thus the ratios of various isotopes will most likely vary from star to star. I passed the suggestion of isotope testing to Moore, who passed it on to Johnson, who began setting up the tests in May.

The isotopic analyses took place at Los Alamos National Laboratory (LANL) on August 1 and 2, 1996. The museum paid $725 for the work. E. Larry Callis of the Chemical Metallurgical Research division performed the tests, which were taped and photographed by LANL personnel and Johnson. Pieces of both the original and a second "fragment" were placed in a mass spectrometer and measured. The Cu-63 results for fragments 1 and 2 were 69.127% and 69.120%, respectively. A piece of normal, refined copper, tested as a control, had a value of 69.129% Cu-63. The accepted value for Cu-63 is 69.174%. And so, the copper was not found to deviate significantly from Earthly isotopic ratios. A similar result was obtained for the silver, which contains 51.840% Ag-107 and 48.160% Ag-109.

The results of the LANL test were mentioned in *NMSR Reports* (the New Mexicans for Science and Reason newsletter), where they caught the eye of *Albuquerque Journal* reporter John Fleck. Fleck's August 13 report on the isotopic analyses caught the eye of someone in St. George, Utah, who called Fleck to tell him where the fragment really came from.

It turns out the fragment was a piece of leftover material created by artist Randy Fullbright. Fullbright uses an ancient Japanese technique (translated as

Examples of artist Randy Fullbright's work on display at James Kallas Jewelers in Santa Fe, New Mexico. Photo by David A. Thomas.

"wood-grain-metal" by Johnson's wife Marilyn) to create the swirly patterns of copper and silver. Fullbright gave the material to a gallery owner, yet to be named, and did not identify it as anything other than scraps from his own artwork. The gallery owner gave it to Blake Larsen, who was leaving St. George to move to Roswell. The gallery owner told Larsen that the fragment was "found near Roswell in 1947." When Larsen got to Roswell, he gave the piece to the museum. Fleck confirmed the details of the story with Fullbright and with Larsen, as well as with museum officials. He published the story in an article, "Artist: Fragment Is Bogus," appearing on the front page of the September 6 *Albuquerque Journal.*

And so ends the saga of the Roswell fragment. The museum officials took the risk of having the debris definitively tested, and scientists reciprocated with serious, careful measurements. The specimen turned out to be Earthly this time. If extraterrestrial landings are ever to be confirmed in the future, it may be with experiments like these.

—David E. Thomas

David E. Thomas is a physicist. He is vice president and communications officer of New Mexicans for Science and Reason.

Penthouse 'Autopsy': Déjà View

Bob Guccione seems to playing P. T. Barnum. When Barnum could not purchase the "Cardiff Giant"—a fake "petrified man" carved from a block of gypsum—he exhibited a replica and billed it as the original.

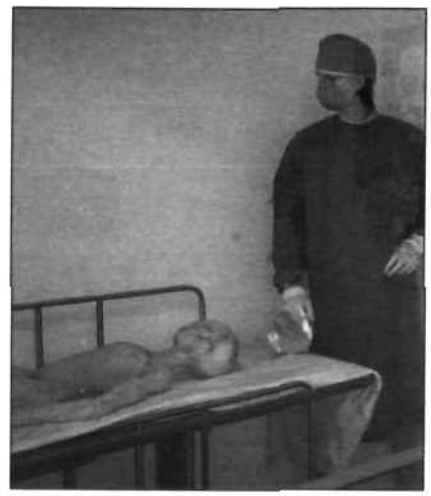
Now the *Penthouse* publisher is promoting a strange creature, and it's déjà vu all over again. Branding as a hoax Fox TV's "Alien Autopsy" film—which purports to depict extraterrestrials that crashed at Roswell, New Mexico, in 1947—Guccione alleges he has the real thing. Claiming as a source the daughter of a scientist who came here from Germany at the beginning of World War II, Guccione published a few of several frames of movie film that show the "real" alien autopsy.

"A photograph of Jesus Christ might be a comparable story to the first real photo of an extraterrestrial," he boasts (without apparently intending to equate his images with the fraudulent Shroud of Turin). "Otherwise, there's nothing that compares to this." Not surprisingly, he accuses the government of attempting to suppress the nude photos—no doubt the ugliest ever published by the men's magazine.

That helps explain why Guccione placed the September 1996 issue in plastic bags. "I don't want people picking it up and flipping through it and putting it back on the newsstand," he told the *Tampa Tribune* (August 12).

As it happens, *Penthouse*'s foray into the Roswell morass was quickly branded a hoax. According to the *Albuquerque Journal* (August 20), "The people who run the International UFO Museum on Main Street in Roswell recognize the naked, milky-skinned star of the photo spread as a local—the alien model that lies on a gurney in one of the museum's displays."

The *Journal* quoted museum director Deon Crosby as saying, "We have no question whatsoever that it is the prop. The hospital gurney, the fingers bent exactly the same, the pock marks on the face—everything is identical. Anyone can tell it's the same. We've had a lot of people calling and saying, 'That looks like yours.'"



The model is a prop from the movie *Roswell,* which further disseminated the legend of a flying saucer that supposedly crashed near that town in 1947. (For what really crashed on the Brazel ranch, see the special report, "The Roswell Incident and Project Mogul," SKEPTICAL INQUIRER 19(4): 15–18.)

We spoke with Ms. Crosby who assured us of a match between the museum's model and the *Penthouse* photographs. She sent the accompanying photograph of their display.

—Joe Nickell

Where Are the Antiscience Attitudes? Not among the General Public

The antiscience sentiment that scientists and skeptics have been widely bemoaning does not yet seem to have spread from academics and intellectuals into the general population, according to data in the National Science Foundation's *Science & Engineering*

Indicators 1996 report.*

Indeed, support and appreciation for science among the general public has held remarkably strong and steady over the decades, according to the study's survey. (For more than two decades the National Science Board, NSF's policy-making body, has issued biennial reports on the state of science in the U.S. The chapter on public attitudes and public understanding in the 1996 report was prepared by Jon D. Miller and Linda Pifer of the Chicago Academy of Sciences, under contract to NSF.)

For instance, 86 percent of American adults surveyed in 1995 for the new report agreed that "science and technology are making our lives healthier, easier, and more comfortable," up slightly from the 84 percent in 1983. And 72 percent agreed that "the benefits of science are greater than any harmful effects," up from 57 percent in 1983.

About 40 percent of Americans expressed a high level of interest in science discoveries and in the use of new technologies. The NSF says this level of interest has been relatively stable for the past decade, "indicating that science and technology have become an integral part of American culture."

Similarly, the survey's tracking of public confidence in the people running various institutions, surveyed every year or so since 1973, shows the scientific community ranked second among thirteen institutions, behind only medicine. Third was the military, followed by the U.S. Supreme Court. At the bottom of the list were Congress, the press, and TV.

Remarkably, among the thirteen institutions, the scientific community and the military were the only two that showed an increase in public confidence from 1973 to 1994. The survey data confirm the widespread drop in public confidence in U.S. institutions that virtually everyone has noted. For instance, public confidence in Congress, the executive branch of the federal government, and the press each dropped by about a factor of three over those two decades, and confidence in the leaders of education and organized religion dropped by about one-third. Confidence in the leaders of major companies dropped by about 15 percent.

Yet the percentage of adults who expressed a great deal of confidence in the scientific community rose slightly from 37 percent to 38 percent during the same two decades, with only slight year-to-year variations (low of 36 percent in 1977, high of 45 percent in 1987). Medicine retained its top ranking despite dropping over the two decades from a 54 percent to a 41 percent rating.

When the report was issued earlier this year, most of the attention was devoted to the public's generally poor understanding of scientific vocabulary and concepts. Only 21 percent could give a satisfactory explanation of DNA and only 9 percent could explain what a molecule is. Only 44 percent knew that electrons are smaller than atoms, and 73 percent knew that the earth goes around the sun, meaning that 27 percent got it the other way around. As might be expected, only 44 percent said it was true that human beings developed from earlier species of animals. This less-than-majority agreement is probably at least as much a measure of religious resistance to the idea of evolution as a lack of knowledge. For example, a concept at least equally nonintuitive—that the continents on which we live move over periods of millions of years and will continue to do so—was correctly rated as true by 79 percent.

The more education, the more *science* education, and the more the respondents rated themselves as attentive to science, the better the scores. Males generally scored better, except on several biomedical-related questions.

Several questions asked about the nature of scientific inquiry. These asked about such things as the meaning of scientific study and the reasons for the use of control groups in experiments. The study found that only 23 percent of Americans understand the nature of scientific inquiry well enough to make informed judgments about the scientific basis of results reported in the media. Again, higher levels of education and greater exposure to science courses resulted in higher results.

So, as other commentators have noted before, the American public seems to have a strong appreciation for science but little substantive knowledge of it.

Public Less Positive about Certain Technologies

The one part of the National Science Board's *Science & Engineering Indicators* survey that does show some public ambiguity toward science showed up in questions about the impact of several important science-based technologies.

The survey showed Americans evenly divided on the benefits and drawbacks of using nuclear power to generate electricity. This division has lasted more than a decade, say the survey authors.

A similar division exists over the benefits and potential drawbacks of genetic engineering; but the balance was slightly toward the positive, and there is a clearer difference by level of education. College graduates hold a more positive view of such research.

As for the space program, the general public was evenly divided over the relative benefits and costs. College graduates and those who say they are interested in space exploration were very positive about the space program.

In all these areas, those attentive to the related policy issues continue to have strong positive views of the technologies and programs, say the survey authors. But the attentive public remains fairly small, approximately 10 percent of adults.

So what about the antiscience sentiment that has so concerned scientists—that has been the subject of books, articles, debates, and symposium sessions at the recent CSICOP twentieth-anniversary conference "Science in the Age of (Mis)Information"?

Well, this survey didn't seek out attitudes among the populations where scientists say antiscience attitudes are rampant—in university humanities and social science departments and among other intellectuals and writers and opinion leaders. The concern, they say—and this was emphasized several times at the CSICOP conference by *Nature*'s John Maddox and others—is that antiscience attitudes are endemic among a relatively small but especially articulate and influential group of academics, including numbers of teachers of the next generation of liberal arts majors, our future politicians and business leaders.

Paul Gross and Norman Levitt's much-discussed book on antiscience attitudes in academia, *Higher Superstition,* focused especially on the "peculiarly troubled relationship between the natural sciences and a large and influential segment of the American academic community," which, "for convenience but with great misgiving," they called "the academic left."

"To put it bluntly," they said, "the academic left dislikes science." In addition to the academic left's expected hostility to the uses to which science is put by the economic and military establishments, Gross and Levitt identify a "more surprising" open hostility to the content of science and to the assumption "which one might have supposed universal among educated people, that scientific knowledge is reasonably reliable and rests on a sound methodology" (p. 2).

In his new book *Einstein, History, and Other Passions,* subtitled "The Rebellion Against Science at the End of the Twentieth Century," Gerald Holton indicts "a segment of academics, eloquent popularizers, and policy makers" for mounting "a challenge to the very legitimacy of science in our culture." This movement, he says, "signals the resurgence of a recurring rebellion against some of the presuppositions of Western civilization derived from the Enlightenment period." He adds, "The impact of this reviving rebellion on the life of the scientist, on the education of the young, on public understanding of science generally, and on the legislation of science support is measurably growing."

It would be interesting to ask nonscience academics and other opinion leaders the same questions that are summarized in the *Science & Engineering Indicators* report and track the trends in *their* attitudes toward science over the years.

In the meantime, scientists can take some consolation from the fact that the *Science & Engineering Indicators* report shows that support and appreciation for science among the American adult general public remains strong and steady, while lamenting the very real concern about the public's lack of understanding of the science they hold in such high esteem.

—Kendrick Frazier, Editor

*National Science Board, *Science & Engineering Indicators—1996.* Washington, D.C.: U.S. Government Printing Office, 1996. (NSB 96-21)

'Evolution' Loses Out in New Mexico Science Standards

When New Mexico's state Board of Education dropped the word "evolution" from its new science education standards, local science groups stepped up their educational campaigns, the American Civil Liberties Union said it would sue, and the *Albuquerque Journal* published a lengthy and well-informed editorial condemning the board for losing its backbone. A day later it also published the accompanying editorial cartoon by its brilliant cartoonist John Trever. He followed a week later with another.

The *Journal* editorial was titled "Include Evolution in School Standards." "A well-educated student should have basic knowledge of evolution by the time she or he graduates from high school," it said. "Studying science without learning about evolution would be like studying English literature without ever learning about Shakespeare."

Unfortunately, the *Journal*'s strong editorial support for inclusion of the scientific view of evolution came after the August 22 vote of the board to adopt standards omitting the word "evolution." Instead, the board approved a new draft it made available only a short time before the vote, stating students should "know theories of biological origin based on direct observations, investigations, or historical data."

In the weeks leading up to the decision, members of the New Mexicans for Science and Reason (NMSR)—the local CSICOP-type group—and other members of the local scientific and educational community worked hard trying to achieve science standards that did justice to science and to the needs of the state's science teachers. They invited board of education staff to an NMSR meeting for an open discussion, had private meetings with board officials, compiled and sent memos and statements, and participated in the board's meetings.

The initial concern was that the draft standards, which included a short section on evolution, were so vague as to be almost meaningless. One goal was to urge the board to beef them up with additional phraseology from the national science education standards recently published by the National Academy of Sciences.

But the board, which includes several anti-evolution sympathizers and at least one confirmed creationist (who likes to quote the Institute for Creation Research), voted to sidestep the evolution issue by avoiding the word altogether—as the *Albuquerque Journal* editorial put it, "by leaving out specific reference to one of the major scientific theories in the

Trever, *Albuquerque Journal*, by permission.

history of human knowledge."

On August 31 came word from the American Civil Liberties Union that if the state school board requires that creationism be taught in science classes, it will be hit with a lawsuit "it can't win," according to ACLU president Jennie Lusk. The state school superintendent was quoted as saying he wouldn't be intimidated by lawsuit threats and maintained that the new standards weren't an opening for entrance of religious dogma into the schools.

In contrast, board member Virginia Trujillo, with whom NMSR members had worked closely, said the board's actions "opened the door to creationism. I really think that, by taking the word 'evolution' out of the standards, they opened the door. . . . I'm hoping, at some point, we'll be able to amend it."

The same issue of the *Journal* that reported the ACLU's warning contained an excellent op-ed page article by David E. Thomas, NMSR's vice president and one of the scientists most active in fighting the watered-down science standards. Titled "Bad Science Sneaks Into Schools," Thomas's article skillfully reported behind-the-scenes details of the state board's decisions.

Thomas also revealed that one member of the board, Roger Lenard, its "unofficial science expert"—described by Thomas as "an eloquent and effective speaker" who appears to hold most of the board and the Department of Education in his sway"—"appears to be a committed anti-evolutionist."

Thomas reported the misleading claims about evolution Lenard had made in an August 21 board work-study session on standards. (These claims included that no transitional fossils have been found, that scientists deeply dispute evolution, and that evolution can't be proved. Elsewhere Lenard had maintained that evolution hasn't been observed and that it has no testable predictive capability.) "Each of these pseudoscience claims has appeared for years in creationist literature, and each has been soundly refuted by one scientist after another," Thomas said. He outlined examples from the scientific literature.

Thomas described efforts parents, teachers, and local scientists had made to stop the new science standards from "degenerating into a state-approved tool for the promotion of pseudoscience."

"The new science standard will cheat the children of New Mexico," Thomas wrote. "This is not simply an issue of creation versus evolution. This is about good science versus bad science." He asked that scientists, students, clergy, and parents write him about their concerns.

On September 1, the *Journal* prominently published on the front page of its Sunday "Dimension" section a lengthy *Chicago Tribune* article by Jeremy Manier about the most recent efforts of religious creationists to push evolution out of U.S. schools.

On September 2, the afternoon *Albuquerque Tribune* published an op-ed page column by NMSR member and physicist Mark Boslough titled "State School Board Should Not Have Coddled Creationism." Boslough said the creationists "are not just anti-evolution; they are anti-geology." He also stated that "evolution is no more controversial among scientists than is the shape of the earth." According to Boslough, the tactics of creationists in labeling evolution controversial are meant to intimidate teachers. He also addressed the question of why the final draft omitting references to evolution was made public only a short time before the board's vote, ignoring the testimony of all the scientists present and the formal opinions issued by New Mexico science organizations. His hypothesis? The board is controlled by "one or more stealth creationists."

Further protests were quickly mounted. The University of New Mexico's biology and physics and astronomy departments issued strong statements condemning the board action. The chairman of the earth and planetary sciences department also spoke out against it and called on the university itself to issue a statement. The *Albuquerque Tribune* published a long, well-researched front-page article "Scientists Fight for Evolution" (September 14). The *Albuquerque Journal* published a front-page poll showing that 73 percent of New Mexico voters surveyed agreed with the board action. Scientists said the question's wording was subtly biased—it appealed to everyone's sense of fairness in allowing "other theories" to be taught. They requested national support in fighting the board decision.

—Kendrick Frazier, Editor

Fund for the Future

CSICOP AT THE CENTER FOR INQUIRY

An Unprecedented $20 Million Drive for the

Human beings have never understood the material universe as thoroughly as they do today. Yet never has popular hunger for superstition, pseudoscience, and the paranormal been so acute.

CSICOP and the *Skeptical Inquirer* are leading advocates for skepticism nationally and worldwide. But so much more must be done in the years to come.

Day and night, the Center for Inquiry has become a focus of academic and popular inquiry.

Publishing revenues alone cannot fund the bold outreach today's challenges demand. Hence the Fund for the Future Campaign, a ten-year effort to add 20 million dollars to the Center for Inquiry endowments.* Gifts and endowment income will fund projects including:

Council for Media Integrity

Formed just weeks after its inclusion in the Ten-Year Plan, the Council for Media Integrity will monitor and rebut media programs that convey unfounded claims and mislead the public about science. Members include Steve Allen (chair), Carl Sagan, Stephen Jay Gould, and many others. CSICOP will invest in electronic infrastructure to facilitate rapid response to irresponsible programs.

Adult Education

The Council cosponsors the Center for Inquiry Institute, which has already expanded its offerings to include a new three-year certificate program in science and skepticism. Sessions are scheduled in Amherst and Los Angeles.

Enhancing Library Resources

The Center for Inquiry's skeptics' library—already the finest of its kind in the world—needs expanded funding to enlarge its core collection and add electronic media. Worldwide modem access to the library's catalog is already nearly complete.

*Combined endowment goal of CSICOP and the Council for Secular Humanism, both nonprofit tax-exempt educational organizations.

Steve Allen
Honorary Co-chair

Martin Gardner
Honorary Co-chair

uture of Science and Reason

The New Ten-Year Plan

To continue its leadership in the defense of reason, CSICOP has articulated a Ten-Year Plan designed to:

- *Promote science and reason*
- *Develop public support and participation*
- *Develop The Center for Inquiry as an education and research center*
- *Build up the Committee's resources*

The Center for Inquiry attracts global media attention with scholarly conferences and events like this public "Friday the 13th Superstition Bash."

For the Young

To present skeptics' message more compellingly to the young, CSICOP will develop new materials—ranging from age-appropriate print publications to audio and video cassettes and instructional courseware. Goals include enhanced understanding of science and improved critical thinking skills.

Regional Outreach

With the establishment of The Center for Inquiry - West (Los Angeles), The Center for Inquiry - Midwest (Kansas City) and The Center for Inquiry - Rockies (Boulder, Colorado), giant steps have been taken to enhance direct field service to skeptical activists. Additional regional Centers are planned with expanded calendars of activities.

How Can I Help?

The Center for Inquiry Fund for the Future depends on generous support from each of our readers and friends. Gifts of cash, securities, and *other assets are sought.* A *three-*year pledge can make more substantial gifts surprisingly affordable. Many forms of planned giving arrangements can be arranged. All requests will be held in confidence.

Only financial support from skeptics and other friends of science can place the skeptical movement on a firm financial foundation.

At the first World Skeptics Congress in Amherst, New York, participants gave or pledged an unprecedented $201,000 to give the Fund for the Future campaign a vigorous start.

We invite you to make your commitment to the Fund for the Future today. For more information, complete and mail the postpaid reply card.

CSICOP
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'Klass County' UFO Abductions: Inside Jokes Are Flying in *X-Files* Episode

If a lot of names and images in an April episode of *The X-Files* resonated with faithful readers of the SKEPTICAL INQUIRER, it's because the case of a UFO kidnapping was filled with inside jokes, references, and concepts involving people in the UFO field.

The case, told from several (sometimes distorted) perspectives, took place in Klass County, a reference to CSICOP fellow Philip J. Klass. The two military officers posing as space aliens were Air Force Major Robert Vallee and Lt. Jack Sheaffer (switch the first names and you get UFO author Jacques Vallee and CSICOP fellow and SKEPTICAL INQUIRER columnist Robert Sheaffer). The officer who comes looking for them is Sgt. Hynek, a reference to the late J. Allen Hynek, founder of the Center for UFO Studies.

One of the two mysterious Men In Black, in an effort to dissuade electric-company line repairman Roky Criksenson from believing that he saw the UFO abduction, argues that "no other object has been misidentified as a flying saucer more often than the planet Venus." UFO believers and *X-Files* fans have delighted in noting that the dialogue sounds like it came straight out of a Klass book. (The lineman's name is apparently based on a band, Roky Erickson and the Aliens.)

The show included:

• A scene where Lt. Sheaffer, still stunned after his capture by a real UFO while he and Vallee are staging their own UFO "abduction," is carving a mountain out of mashed potatoes à la Richard Dreyfuss' character in *Close Encounters of the Third Kind.*

• An opening scene, reminiscent of the beginning of *Star Wars,* where a seemingly endless superstructure sweeps across the sky. But instead of being the bottom of an Imperial Star Destroyer, it turns out be the base of an electric utility cherry picker.

• An alien autopsy video ("Dead Alien! Truth or Humbug," hosted by Stupendous Yappi) in which the scene revealing the "alien" to be Vallee in a rubber suit has been conveniently excised.

—*C. Eugene Emery, Jr.*

Some Double-Blind Experiments May Not Be So Blind After All

High-quality research is conducted in a randomized, double-blind fashion, where the subjects and the scientists don't know who is getting exposed to which treatment or test. The system is supposed to be designed so the investigators can't unconsciously influence the outcome. But in a report that resonates with some of the problems seen when scientists explore the supernatural, Kenneth F. Schulz of the Centers for Disease Control and Prevention has uncovered evidence that many double-blind studies may not be as blind and random as they're supposed to be.

Reporting in the *Journal of the American Medical Association* (274 [18]: 1456–8 [November 8, 1995]), Schulz said that in workshops he's conducted "more than half of the participants at each workshop" say they have deciphered or witnessed someone else deciphering the code for assigning people to at least one clinical trial.

Among the methods used: checking a bulletin board to adjust who goes into which treatment group, opening unsealed assignment envelopes, holding the envelopes up to the light (in some cases using a special "hot light" in the radiology department), feeling the different weights of the envelopes, and opening many envelopes that were not sequentally numbered "until a desired treatment was found."

"Succumbing to temptation may sometimes reflect deliberate acts to alter findings," he said. "At other times, succumbing may be an innocent reflection of human inquisitiveness and ingenuity rather than scientific malevolence."

Schulz said researchers "intellectually grasp the need" for randomized, blinded trials, but human nature may tempt them to cheat. "They perhaps 'know' the more effective treatment, so they may want certain patients to benefit or may want the results of the study to reveal what they believe to be valid."

The findings, which raise the same issues that have swirled around experiments in parapsychology for years, may explain why studies with inadequate safeguards against cheating tend to make a treatment look 30 to 40 percent more effective than experiments where good safeguards are in place, according to Schulz.

In other cases, cheating can have the unintended effect of undermining an effective treatment. If doctors can surreptitiously guide their sickest patients away from the control group and into the treatment group, it can make an experimental treatment appear less effective than it actually is.

—*C. Eugene Emery, Jr.*

Gene Emery writes the SKEPTICAL INQUIRER's "Media Watch" column.

The New Medicine Goes to Congress

Robert L. Park of the American Physical Society, Washington, D.C., is known for his perceptive if acerbic reports and commentaries on the science policy scene. The following is printed by permission from his "What's New" electronic newsletter of August 16, 1996.

1. **Book Review:** ***Manifesto for a New Medicine.*** By James Gordon. The first thing you learn about the "new medicine" is that it's the old medicine. Really

old. "It draws on the perspectives and practices of the world's great healing traditions, including Chinese medicine and Indian Ayurveda, Native American and African healing," according to Gordon, who is Director of the Center for Mind-Body Medicine at Georgetown University. Throw in just about anything else that hasn't been scientifically validated, from Rolfing to homeopathy, and you have Gordon's "new medicine." The common ingredient is belief. In the 18th Century, a French royal commission debunked Franz Mesmer's "magnetic healing" in which patients were immersed in vats of iron filings. Gordon applauds the commission, which included Benjamin Franklin and Antoine Lavoisier, not for exposing a charlatan, but for pointing out the importance of "expectation and suggestion." In Gordon's mind, Mesmer "mobilized the patients' belief," altering the physical processes that made them ill. Indeed, Gordon believes hypnosis can improve immune response, heal burns, cure warts, and increase breast size! James Gordon, by the way, also chairs the Advisory Council of the NIH Office of Alternative Medicine, the office responsible for evaluating the "new medicine." Is there a mind-body connection? Of course! I read Gordon's book and got sick.

2. Alternative Legislation: "Access to Medical Treatment Act." Gordon testified on behalf of S.1035 at a Senate hearing just before the August break, while waving his book above his head. Wayne Jonas, head of the Office of Alternative Medicine, also testified, along with a former congressman who claims he was cured of Lyme disease by eating whey. The bill guarantees the right to treatment by the witch doctor of your choice (no licensed required) and shifts the burden to the government to prove that a treatment is unsafe; efficacy didn't even come up. The good news is that S.1035 has no chance of passage this year, and several of its Senate champions, Pell, Kassebaum, Hatfield, and Simon, are retiring—one, Bob Dole, has retired already.

In Memoriam
Gordon Stein
1941–1996

SKEPTICAL INQUIRER sadly reports the passing of one of its best-known writers, Gordon Stein. An internationally known humanist and expert on hoaxes, Gordon died Tuesday, August 27, at Buffalo General Hospital after a brief illness. He was only 55.

Gordon received a Ph.D. in physiology from Ohio State University in 1974. He later obtained a second master's degree in management and a third in library science at the University of California at Los Angeles. He taught at the University of Rhode Island and—at the time of his death—was Director of Libraries at the Center for Inquiry in Amherst, New York. He was making excellent progress in amassing the largest collection of freethought and skeptical literature in the world.

In addition to his articles and book reviews for SKEPTICAL INQUIRER, he was Technical Consultant for CSICOP. He was also a well-known authority on hoaxes and deceptions. He was editor of the *Encyclopedia of Hoaxes* (1993) and, most recently, *The Encyclopedia of the Paranormal* (1996), published by Prometheus Books.

In addition, he was Senior Editor of *Free Inquiry* magazine. He also edited the magazine *American Rationalist*. His rationalist/humanist books included *Robert G. Ingersoll* (1969), *An Anthology of Atheism and Rationalism* (1980), and *The Encyclopedia of Unbelief* (1985).

His two areas of specialty, humanism and hoaxes, combined to make him an authority on spiritualism (the supposed communication with spirits of the dead) as well. He wrote and lectured extensively on that subject, and he penned a biography of the notorious spiritualist medium D. D. Home, called *The Sorcerer of Kings* (1993).

Survivors include a former wife, Barbara (Laiks) Stein, and their daughter Karen. He is survived by another former wife, Eve Triffo, and his only sister, Irna S. Jay.

In keeping with his wishes, his remains were cremated. A humanist ceremony to honor his life was held Friday, August 30, at the Center for Inquiry.

—Joe Nickell

That's Astronomy, Not Astrology

The following letter to the Book-of-the-Month Club by Jamie Hagedorn of Evanston, Ill., is self-explanatory. Ms. Hagedorn kindly sent it to us, and we share it with you:

June 24, 1996

Greg Tobin, Editor-in-Chief
Book-of-the-Month Club
Camp Hill, PA 17012-0001

Dear Mr. Tobin:

I was dismayed to read in the July 1996 *BOMC Views* that Terence Dickinson's astronomy handbook, *Summer Stargazing*, is described as a "practical guide for recreational astrologers." I trust that you and all the members of your staff know the difference between astrology and astronomy, so it is difficult for me to imagine how this error made it into print without anyone catching it—especially since the book jacket shown alongside the erroneous description plainly states that the books is a guide for astronomers.

In general, I have been depressed to see the great number of books on New Age topics and pseudoscience that have been offered by BOMC in the last year or so. I realize that you are in the business of selling books, and that the fact that you are selling a book does not imply agreement with its content. However, given the extent to which pseudoscience has superseded science in the public imagination, I am troubled to see it promoted as well by Book-of-the-Month Club, which I once thought had more sense than that.

For a refresher course on the pitfalls, even the dangers, of elevating superstition over science, I suggest you reread one of your excellent recent offerings, Carl Sagan's *The Demon-Haunted World*.

Yours truly,
Ms. Jamie Hagedorn

Physicist Alan Sokal's Hilarious Hoax

> It is simply a logical fallacy to go from the observation that science is a social process to the conclusion that the final product, our scientific theories, is what it is because of the social and historical forces acting in this process. A party of mountain climbers may argue over the best path to the peak, and these arguments may be conditioned by the history and social structure of the expedition, but in the end either they find a good path to the peak or they do not, and when they get there they know it. (No one would give a book about mountain climbing the title *Constructing Everest.*)
>
> —Steven Weinberg, *Dreams of a Final Theory,* Chapter 7

In a Spring/Summer 1996 issue devoted to what they called "Science Wars," the editors of *Social Text,* a leading journal of cultural studies, revealed themselves to be unbelievably foolish. They published an article titled "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity." It was written by Alan Sokal, a physicist at New York University. His paper included thirteen pages of impressive endnotes and nine pages of references.

Why were the editors foolish? Because Sokal's paper was a deliberate hoax, so obvious in its gibberish that any undergraduate in physics would have at once recognized it as a hilarious spoof. Did the editors bother to check with another physicist? They did not. To their everlasting embarrassment, at the same time they published the hoax, *Lingua Franca,* in its May/June 1996 issue, ran an article by Sokal in which he revealed the joke and explained why he had concocted it.

Sokal opened his parody with a strong attack on the belief that there is "an external world whose properties are independent of any human individual and indeed of humanity as a whole." Science, he continued, cannot establish genuine knowledge, even tentative knowledge, by using a "so-called" scientific method.

"Physical reality . . . is at bottom a social and linguistic construct," Sokal maintained in the next paragraph. In his *Lingua Franca* confessional he comments: "Not our *theories* of physical reality, mind you, but the reality itself. Fair enough: Anyone who believes the laws of physics are mere social conventions is invited to try transgressing those conventions from the windows of my apartment (I live on the twenty-first floor)."

Here are a few more absurdities defended in Sokal's magnificent spoof:

- Rupert Sheldrake's morphogenetic fields are at the "cutting edge" of quantum mechanics. (On Sheldrake's psychic fantasies see Chapter 15 of my *The New Age,* published by Prometheus Books in 1991.)
- Jacques Lacan's Freudian speculations have been confirmed by quantum theory.
- The axiom that two sets are identical if they have the same elements is a product of "nineteenth-century liberalism."
- The theory of quantum gravity has enormous political implications.
- Jacques Derrida's deconstructionist doctrines are supported by general relativity, Lacan's views are boosted by topology, and the opinions of Ms. Luce Irigaray, France's philosopher of feminism, are closely related to quantum gravity.

The funniest part of Sokal's paper is its conclusion that science must emancipate itself from classical mathematics before it can become a "concrete tool of progressive political praxis." Mathematical constants are mere social constructs. Even pi is not a fixed number but a culturally determined variable!

I hope no reader tries to defend this by pointing out that pi has different numerals when expressed in a different notation. To say that a notation alters pi is like saying 3 has a different value in France because it is called *trois.*

Pi is precisely defined within the formal system of Euclidian geometry, and has the same value inside the sun or on a planet in Andromeda. The fact that space-time is non-Euclidian has not the slightest effect on pi. African tribesmen may think pi equals 3, but that's a matter not of pure math but of applied math. This confusion of the certainty of

mathematics within a formal system and the uncertainty of its applications to the world is a common mistake often made by ignorant sociologists.

The media had a field day with Sokal's hoax. Edward Rothstein's article in the *New York Times* (May 26, 1996) was titled "When Wry Hits Your Pi from a Real Sneaky Guy." Janny Scott's piece "Postmodern Gravity Deconstructed, Slyly" ran on the front page of the *New York Times* (May 18). Roger Kimball wrote in *The Wall Street Journal* on "A Painful Sting within the Academic Hive." George Will, in his syndicated column, gloated over Sokal's flimflam. *Social Text,* he predicted, "will never again be called a 'learned journal.'"

The editors of *Social Text* were understandably furious. Stanley Aronowitz, cofounder of the journal, is a Marxist sociologist. He branded Sokal "ill-read and half-educated." Andrew Ross, another leftist and the editor responsible for putting together the special issue, said he and the other editors thought Sokal's piece "a little hokey" and "sophomoric." Why then did they publish it? Because they checked on Sokal and found he had good credentials as a scientist.

The strongest attack on the hoax came from Stanley Fish, an English professor at Duke University and executive director of the university's press, which publishes *Social Text.* Fish has long been under the spell of deconstructionism, an opaque and rapidly fading French movement that replaced existentialism as the latest French philosophical fad. In his "Professor Sokal's Bad Joke," on the *New York Times* Op-Ed page (May 21, 1996), Fish vigorously denied that sociologists of science think there is no external world independent of observations. Only a fool would think that, he said. The sociologists contend nothing more than what observers *say* about the real world is "relative to their capacities, education, training, etc. It is not the world or its properties but the vocabulary in whose terms we know them that are [*sic*] socially constructed."

In plain language, Fish is telling us that of course there is a structured world "out there," with objective properties, but the way scientists *talk* about those properties is cultural. Could anything be more trivial? The way scientists talk obviously is part of culture. Everything humans do and say is part of culture.

Having admitted that a huge universe not made by us is out there, independent of our little minds, Fish then proceeds to blur the distinction between scientific truth and language by likening science to baseball! He grants that baseball involves objective facts, such as the distance from the pitcher's mound to home plate. Then he asks: "Are there balls and strikes in nature (if by nature you understand physical reality independent of human actors)?" Fish answers: No. Are balls and strikes social constructs? Yes.

Let's examine this more closely. The sense in which balls and strikes are defined by a culture is obvious. Chimpanzees and (most) Englishmen don't play baseball. Like the rules of chess and bridge, the rules of baseball are not part of nature. Who could disagree? Nor would Fish deny that pitched baseballs are "out there" as they travel objective paths to be declared balls and strikes by an umpire. Even the umpire is not needed. A camera hooked to a computer can do the job just as well or better. The basis for such decisions are of course cultural rules, but the ball's trajectory, and whether it goes over the plate within certain boundaries, is as much part of nature as the path of a comet that "strikes" Jupiter.

The deeper question that lies behind the above banalities is whether the rules of baseball are similar to or radically different from the rules of science. Clearly they are radically different. Like the rules of chess and bridge, the rules of baseball are made by humans. But rules of science are not. They are discovered by observation, reason, and experiment. Newton didn't invent his laws of gravity except in the obvious sense that he thought of them and wrote them down. Biologists didn't "construct" the DNA helix; they observed it. The orbit of Mars is not a social construction. Einstein did not make up $E=mc^2$ the way game rules are made up. To see rules of science as similar to baseball rules, traffic rules, or fashions in dress is to make a false analogy that leads nowhere.

It goes without saying that sociologists are not such idiots as to deny an outside world, just as it goes without saying that physicists are not so foolish as to deny that culture influences science. To cite a familiar example, culture can determine to a large extent what sort of research should be funded. And there are indeed fashions in science. The latest fashion in physics is the superstring theory of particles. It could be decades before experiments, not now possible, decide whether superstring theory is fruitful or a dead end. But that science moves inexorably closer to finding objective truth can only be denied by peculiar philosophers, naive literary critics, and misguided social scientists. The fantastic success of science in explaining and predicting, above all in making incredible advances in technology, is proof that scientists are steadily learning more and more about how the universe behaves.

The claims of science lie on a continuum between a probability of 1 (certainty) and a probability of 0 (certainly false), but thousands of its discoveries have been confirmed to a degree expressed by a decimal point followed by a string of nines. When theories become this strongly confirmed they turn into "facts," such as the fact that the earth is round and circles the sun, or that life evolved on a planet older than a million years.

The curious notion that "truth" does not mean "correspondence with reality," but nothing more than the successful passing of tests for truth, was dealt a death blow by Alfred Tarski's famous semantic definition of truth: "Snow is white" is true if and only if snow is white. The definition goes back to Aristotle. Most philosophers of the past, all scientists, and all ordinary people accept this definition of what they *mean* when they say something is true. It is denied only by a small minority of pragmatists who still buy John Dewey's obsolete epistemology.

Martin Gardner's latest book is The Night Is Large: Collected Essays 1938–1995 *(St. Martin's Press, 1996).*

Those who see science as mythology rather than an increasingly successful search for objective truth have been roughly grouped under the term "postmoderns." It includes the French deconstructionists, some old-fashioned Marxists, and a few angry feminists and Afrocentrists who think the history of science has been severely distorted by male and white chauvinism. Why did men study the dynamics of solids before they turned their attention to fluid dynamics? It is hard to believe, but one radical feminist claims it was because male sex organs become rigid, whereas fluids suggest menstrual blood and vaginal secretions!

A typical example of postmodern antirealism is Bruce Gregory's *Inventing Reality: Physics as Language.* The title tells it all. See my SKEPTICAL INQUIRER column "Relativism in Science" (Summer 1990), reprinted in *On the Wild Side* (Prometheus, 1992), for a review of this peculiar book. For a more resounding attack on such baloney, I highly recommend the recently published *Einstein, History, and Other Passions: The Rebellion Against Science at the End of the Twentieth Century* (Addison Wesley, 1996) by the distinguished Harvard physicist and science historian Gerald Holton.

The late Thomas Kuhn's famous book *The Structure of Scientific Revolutions* has been responsible for much postmodern mischief. Pragmatist Kuhn saw the history of science as a series of constantly shifting "paradigms." The final chapter of his book contains the following incredible statement: "We may, to be more precise, have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer and closer to the truth." As if Copernicus did not get closer than Ptolemy, or Einstein closer than Newton, or quantum theory closer than earlier theories of matter! It takes only a glance at a working television set to see the absurdity of Kuhn's remark.

Fish and his friends are not that extreme in rejecting objective truth. Where they go wrong is in their overemphasis on how *heavily* culture influences science, and above all, in their obfuscatory style of writing. Examining interactions between cultures and the history of science is a worthwhile undertaking that may even come up someday with valuable new insights. So far it has had little to say that wasn't said earlier by Karl Mannheim and other sociologists of knowledge. Meanwhile, it would be good if postmoderns learned to speak clearly. Scientists and ordinary people talk in a language that takes for granted an external world with structures and laws not made by us. The language of science distinguishes sharply between language and science. The language of the sociologists of science blurs this commonsense distinction.

It is almost as if Fish were to astound everyone by declaring that fish are not part of nature but only cultural constructs. Pressed for clarification of such a bizarre view he would then clear the air by explaining that he wasn't referring to "real" fish out there in real water, but only to the *word* "fish." In a fundamental sense scientists and sociologists of science may not disagree. It's just that the sociologists and postmoderns talk funny. So funny that when Sokal talked even funnier in one of their journals they were unable to realize they had been had.

* * * *

After this column was written, *Lingua Franca,* in its July/August 1996 issue, published an article by Bruce Robbins and Andrew Ross, co-editors of *Social Text,* in which they do their best to justify accepting Sokal's brilliant prank. Their reasons fail to mention the real one—their total ignorance of physics.

In an amusing rejoinder, Sokal writes: "[M]y goal isn't to defend science from the barbarian hordes of lit crit (we'll survive just fine, thank you), but to defend the Left from a trendy segment of itself." His reply is followed by a raft of letters from scholars, some praising Sokal, some condemning him. They add little substance to the debate.

In his Lingua Franca *article Sokal selected this as a typical passage from his hoax:*

From "Transgressing the Boundaries":

Thus, general relativity forces upon us radically new and counterintuitive notions of space, time, and causality; so it is not surprising that it has had a profound impact not only on the natural sciences but also on philosophy, literary criticism, and the human sciences. For example, in a celebrated symposium three decades ago on *Les Langages Critiques et les Sciences de l'Homme,* Jean Hyppolite raised an incisive question about Jacques Derrida's theory of structure and sign in scientific discourse. . . . Derrida's perceptive reply went to the heart of classical general relativity:

> The Einsteinian constant is not a constant, is not a center. It is the very concept of variability—it is, finally, the concept of the game. In other words, it is not the concept of some*thing*—of a center starting from which an observer could master the field—but the very concept of the game.

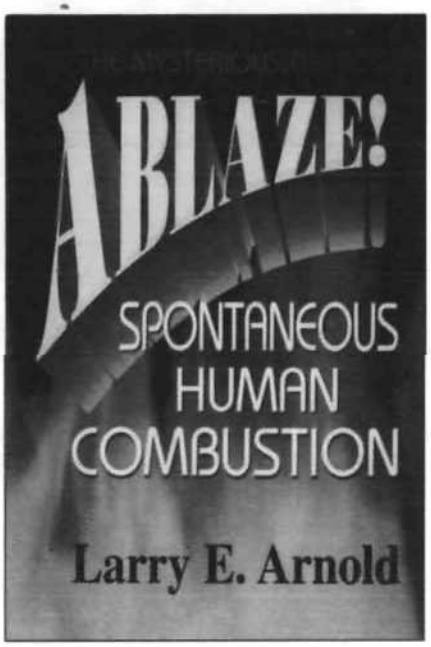
In mathematical terms, Derrida's observation relates to the invariance of the Einstein field equation $G_{\mu\nu}=8\pi GT_{\mu\nu}$ under nonlinear space-time diffeomorphisms (self-mappings of the space-time manifold which are infinitely differentiable but not necessarily analytic). The key point is that this invariance group "acts transitively": this means that any space-time point, if it exists at all, can be transformed into any other. In this way the infinite-dimensional invariance group erodes the distinction between observer and observed; the π of Euclid and the G of Newton, formerly thought to be constant and universal, are now perceived in their ineluctable historicity; and the putative observer becomes fatally de-centered, disconnected from any epistemic link to a space-time point that can no longer be defined by geometry alone.

Not-So-Spontaneous Human Combustion

Like Count Dracula, the mythical specter of "spontaneous human combustion" (SHC) refuses to die. The latest book to fan the flames of belief, so to speak, is *Ablaze!* by Larry E. Arnold. The dust-jacket blurb states that the author "redirected a background in mechanical and electrical engineering to explore the Unconventional." Indeed, Arnold is a Pennsylvania school bus driver who has written a truly bizarre book—one that takes seriously such pseudoscientific nonsense as poltergeists and ley lines (Arnold 1995, 362–6), and that suggests that the Shroud of Turin's image was produced by "flash photolysis" from a body transformed by SHC "into a higher energy state" (463).

As if he were a trained physicist on a par with any Nobel laureate, Arnold blithely posits a subatomic "pyrotron" as the mechanism for SHC (99–106), and he casually opines that "extreme stress could be the trigger that sets a human being ablaze" (163). In the many cases in which the alleged SHC victim had been a careless cigarette smoker or in which the victim's body was found lying on a hearth, Arnold dodges the issue of SHC by invoking "preternatural combustibility" (84), an imagined state in which a body's cells reach a heightened susceptibility to ignition by an outside spark. To understand Arnold's approach we can look at a few of his major examples, those cases which are treated at chapter length.

Arnold leads off with the 1966 case of Dr. John Irving Bentley who was consumed by fire in the bathroom of his home in Coudersport, Pennsylvania. About all that was left of him—in recognizable form—was his lower leg that



had burned off at the knee; it was lying at the edge of a hole about two and a half by four feet which had burned into the basement.

Spontaneous human combustion? Actually the infirm ninety-year-old physician had a habit of dropping matches and hot ashes from his pipe upon his robes which were spotted with burns from earlier occasions. He also kept wooden matches in both pockets of his day robe—a situation that could transform an ember into a fatal blaze. Apparently waking to find his clothing on fire, Dr. Bentley made his way into the bathroom with the aid of his aluminum walker—probably at an accelerated pace—where he vainly attempted to extinguish the flames. Broken remains of what was apparently a water pitcher were found in the toilet. Once the victim fell on the floor, his burning clothing could have ignited the flammable linoleum; beneath that was hardwood flooring and wooden beams—wood for a funeral pyre. Cool air drawn from the basement in what is known as the "chimney effect" could have kept the fire burning hotly (Arnold 1995, 1–12; Nickell and Fischer 1984).

In chapter 6, Arnold relates the fiery death of a widow, Mary Reeser, who perished in her efficiency apartment in St. Petersburg, Florida, in 1951. The case, a classic of SHC, has long been known as the "cinder woman" mystery. Except for a slippered foot, Mrs. Reeser's body was largely destroyed, along with the overstuffed chair in which she had been sitting and an adjacent end table and lamp (except for the latter's metal core). The rest of the apartment suffered little damage. "Nor," adds Arnold, "did the carpet beyond her incinerated chair show signs of fire damage!" (76)

In fact, the floors and walls of Mrs. Reeser's apartment were of concrete.

When last seen by her physician son, Mrs. Reeser had been sitting in the big chair, wearing flammable nightclothes, and smoking a cigarette—after having taken two Seconal sleeping pills and stating her intention of taking two more. The official police report concluded, "Once the body became ignited, almost complete destruction occurred from the burning of its own fatty tissues." (Mrs. Reeser was a "plump" woman, and a quantity of "grease"—obviously fatty residue from her body—was left at the spot where the immolation occurred.) As the fat liquefied in the fire, it could have been absorbed into the chair stuffing to fuel still more fire to attack still more of the body (Arnold 1995, 73–91; Nickell and Fischer 1984). We will discuss the "candle effect" more fully later on.

Arnold wonders why extremities, such as a victim's leg, and nearby combustibles are not burned. The answer is that fire tends to burn upward . . .

In chapter 15, Arnold relates the case of one Jack Angel, who told him "an incredible incendiary tale." Angel stated that in mid-November 1974, while he was a self-employed traveling salesman, he awoke in his motorhome in Savannah, Georgia, to find that he had a severely burned hand, which later had to be amputated, plus a "hell of a hole" in his chest, and other burns—in the groin area, and on the legs and back "in spots!" Angel claimed one of his doctors said he had not been burned externally but rather internally, and he claimed to be a survivor of SHC. Interestingly, his clothing had not been burned, and there were no signs of burning in his motorhome.

Unfortunately, when Arnold and I appeared on a Canadian television show to debate SHC, Arnold was unaware of an earlier story about the injuries that Angel had told—in court. I revealed it on the show for the first time (courtesy of fellow investigator Phil Klass), thus publicly embarrassing Arnold, who has ever since been trying to rationalize away the evidence.

As it happens, a 1975 civil-action suit filed by Angel's attorney in Fulton County Superior Court tells how Angel (the plaintiff) was in his motorhome and "while Plaintiff was in the process of taking a shower, the water suddenly stopped flowing from the shower plumbing." In attempting to learn why there was insufficient water pressure, Angel "exited said motorhome and attempted to inspect the hot water heater. In making said inspection, the pressure valve on the hot water heater released and as a result, scalding hot water under tremendous pressure was sprayed upon plaintiff." The complaint claimed that the defendant, the manufacturer of the motorhome, was negligent both in the design of the heater and valve and in failing to provide adequate warning of the damage. The suit was later transferred to federal court where it was eventually dismissed for costs paid by the defendant.

Arnold attempted to rebut this evidence, for example, by quoting some motorhome mechanics, but it does not seem that he gave the mechanics the full facts in soliciting their statements. For instance, forensic analyst John F. Fischer and I did not postulate "a bad valve" (as Arnold quoted the servicemen as stating we did in *Fate* magazine). Indeed, Arnold has repeatedly dodged—even outright omitted—powerful corroborative evidence, such as the water pump's drive belt being off, the water pump's drive pulley being loose, and the water heater's safety relief valve being in the open position! In our investigative report John Fischer and I listed more than a dozen additional corroborative factors, including the unburned clothes, which were especially consistent with scalding. We even included the opinions of two doctors whom Arnold cites as having diagnosed "electrical burns" as if their opinions—which were again apparently based on incomplete information—were more harmful to our position than his (Arnold 1995, 227–36; Nickell with Fischer 1992, 165–75).

Arnold's next major case is that of Helen Conway, who perished in 1964 in Delaware County, Pennsylvania. Except for her legs, her body was largely destroyed along with the upholstered chair in which she sat in her bedroom. The destruction took place in only twenty-one minutes (according to the fire marshal), although Arnold uses "commonsense deduction" (and an assumption or two) to whittle the time down to just six minutes (which becomes "a few seconds" in the caption to a photograph). Arnold asserts Mrs. Conway's body "exploded."

In fact Mrs. Conway was an infirm woman, who (according to the fire marshal) was also "reported to have been a heavy smoker with careless smoking habits." He added: "Cigarette burn marks were evident about the bedroom." (It is curious how people who are careless with fire are those who attract SHC.)

Apparently the fire took less time to destroy Mrs. Conway's torso than it did the body of Mary Reeser, but it may have begun at the base of the seated body and burned straight upward, fed by the fat in the torso, and may have thus been a much more intense fire—not unlike grease fires that all who cook are familiar with. Indeed, in searching through the dense smoke for the victim, an assistant chief sank his hand "into something greasy" that proved to be the woman's remains.

As to the bits of scattered debris that Arnold cites as evidence of "Spontaneous Human Explosion" (388), they could have been scattered by the chair's heavy right arm having fallen across the body at one point. Another possibility is revealed by the fact that the assistant fire marshal stated, "There wasn't debris scattered all over" (384), even though bits of debris are indeed shown in photos of the scene (illus. facing p. 212). In other words, the scattering may not have originally been present at the scene but could have been due to splashback from the firemen's high-pressure spray that was used to extinguish nearby flames. It is important to note that it is only

Arnold—and not the fire officials, who actually blamed the fire on a dropped cigarette—who claimed the body exploded (378–92).

The fifth and last of Arnold's chapter-length cases is that of a fifty-eight-year-old retired fireman named George Mott. He died in 1986 in the bedroom of his home outside Crown Point, New York. His body was largely consumed along with the mattress of the bed on which he had lain. A leg, a shrunken skull (reported to have shrunk to an implausibly small size), and pieces of the rib cage were all that remained that were recognizably human. Arnold insists that there was no credible source for the ignition.

Whether or not we agree with Arnold's dismissal of the theories of two fire investigators—first, that an electric arc shot out of an outlet and ignited Mott's clothing, and second, that an "undetected" gas leak had been responsible—there are other possibilities. Mott was a man who formerly drank alcohol and smoked heavily. The day before he died he had been depressed over his illnesses which included respiratory problems and high blood pressure. What if, as could easily happen in such a state of mind, he became fatalistic and, shrugging off the consequences, opted for the enjoyment of a cigarette? This possibility gains credence from the fact that he was not wearing his oxygen mask although he was in bed and his oxygen-enricher unit was running. On top of the unit, next to the mask, was an otherwise puzzling canister of "barn burner" matches, yet there was no stove or other device in the room they would be used for. (At least Arnold does not mention a stove or other device being in the room. If there was, then we have another possible explanation for the fire, and there are additional potential explanations in any case—each more likely than SHC.) (Arnold 1995, 393–411)

Now Arnold cites the Mott case as a quintessential one of SHC, based on the process of elimination. He does not allow SHC to be eliminated, however, although there is no single instance that proves its existence and no known mechanism by which it could occur. And so he often dismisses what he feels is unlikely in favor of that which the best scientific evidence indicates is impossible. Such thinking has been called "straining at a gnat and swallowing a camel."

In fact Arnold's process-of-elimination approach here as elsewhere is based on a logical fallacy called "arguing from ignorance." As the great nineteenth-century scientist Justus von Liebig explained: "The opinion that a man can burn of himself is not founded on a knowledge of the circumstances of the death, but on the reverse of knowledge—on complete ignorance of all the causes or conditions which preceded the accident and caused it" (Liebig 1851).

In his relentless drive to foster any sort of mystery, in this and other cases, Arnold raises many attendant questions. For example, he wonders why extremities, such as a victim's leg, and nearby combustibles are not burned. The answer is that fire tends to burn upward; it burns laterally (sideways) with some difficulty. Anyone with camping experience has seen a log that was laid across a campfire reduced to ashes by the following morning while the butt ends of the log remained intact. Thus, outside the circle that burned through the carpet covering the concrete floor of Mary Reeser's apartment was found her slippered foot, because Mrs. Reeser had a stiff leg that she extended when she sat. Beyond the circle some newspapers did not ignite, while a lamp and table within it did burn. Similarly, Dr. Bentley's intact lower leg extended outside the edge of the hole that burned through his bathroom floor.

Anyone with camping experience has seen a log that was laid across a campfire reduced to ashes . . . while the butt ends of the log remained intact.

Beyond this matter of proximity, Arnold cites other examples of fire's "selectivity" that puzzle him. For example, in the Mott case, he wonders why matches near the burning bed did not ignite, while objects in other rooms suffered severe heat damage. The answer is one of elevation: Heat rises. In Mrs. Reeser's apartment, due to the accumulation of hot gases, soot had blackened the ceiling and walls above an almost level line some three and a half feet above the floor, there being negligible heat damage below the smoke line but significant damage above it: for example, plastic electrical switches had melted. Thus, in George Mott's house, reports Arnold, "On the counter directly beneath the melted towel holder sits an unopened roll of Bounty towels, upright. Ironically, it and its plastic wrapping were undamaged except for a glazed film on the top!" (Arnold 1995, 398)

Other factors relevant to heat-damage "selectivity" include the object's composition, density, confinement (for example, in a cupboard), placement on a surface that either radiates or retains heat, or its placement relative to convective currents, cinders carried aloft, and so forth.

While acknowledging that there is often a source for the ignition of the body, Arnold points to the sometimes extreme destruction—of the torso especially—as evidence, if not of SHC, then of preternatural combustibility, the imagined heightening of the body's flammability. In the nineteenth century, alcohol consumption was thought to cause increased flammability, but we now know that its only effect is in making people more careless with fire and less effective in responding to it (Nickell and Fischer 1984).

Arnold and other SHC advocates are quick to suggest that bodies are difficult to burn (which is true under certain circumstances). According to popular SHC writer Vincent Gaddis, "the notion that fluid-saturated fatty tissues, ignited by an outside flame, will burn and produce enough heat to destroy the rest of the body is nonsense" (Gaddis 1967).

Actually the reference to "fluid-saturated" tissues is correct but misleading in Gaddis' attempt to suggest that an external source of ignition could not cause such extreme destruction to a body because the great amount of water would retard burning. In fact the argument works more strongly *against* the concept of SHC than for it, there being no known means by which such fluid-saturated tissue could *self*-ignite. On the other hand, it is a fact that human fatty tissue will burn, the water it contains being boiled off ahead of the advancing fire.

Referring specifically to claims of SHC (and favorably citing research done by John F. Fischer and me), a standard forensic text, *Kirk's Fire Investigation,* states:

> Most significantly, there are almost always furnishings, bedding, or carpets involved. Such materials would not only provide a continuous source of fuel but also promote a slow, smoldering fire and a layer of insulation around any fire once ignited. With this combination of features, the investigator can appreciate the basics—fuel, in the form of clothing or bedding as first ignition, and then furnishings as well as the body to feed later stages; an ignition source—smoking materials or heating appliances; and finally, the dynamics of heat, fuel, and ventilation to promote a slow, steady fire which may generate little open flame and insufficient radiant heat to encourage fire growth. In some circumstances the fat rendered from a burning body can act in the same manner as the fuel in an oil lamp or candle. If the body is positioned so that oils rendered from it can drip or drain onto an ignition source, it will continue to fuel the flames. This effect is enhanced if there are combustible fuels—carpet padding, bedding, upholstery stuffing—that can absorb the oils and act as a wick. (DeHaan 1991, 305)

Dr. Dougal Drysdale of Edinborough University agrees:

> The idea that the body can burn like a candle isn't so far fetched at all. In a way, a body is like a candle—inside out. With a candle the wick is on the inside, and the fat on the outside. As the wick burns the candle becomes molten and the liquid is drawn onto the wick and burns. With a body, which consists of a large amount of fat, the fat melts and is drawn onto the clothing which acts as a wick, and then continues to burn. (Drysdale 1989)

Experiments show that liquefied human fat burns at a temperature of about two hundred and fifty degrees Celsius; however, a cloth wick placed in such fat will burn even when the temperature falls as low as twenty-four degrees Celsius (Dee 1965). In an 1854 English case, a woman's body had been partially destroyed in the span of two hours; it was explained that "beneath the body there was a hempen mat, so combustible, owing to the melted human fat with which it was impregnated, that when ignited it burnt like a link [i.e., a pitch torch]" (Stevenson 1883, 718–27).

Even a lean body contains a significant amount of fat, which is present even in the bone marrow (Snyder 1967, 233, 242). Indeed, "once the body starts to burn, there is enough fat and inflammable substances to permit varying amounts of destruction to take place. Sometimes this destruction by burning will proceed to a degree which results in almost complete combustion of the body," as police officials reported in the Mary Reeser case (Blizin 1951). Moreover, in general, "women burn hotter and quicker than men, because proportionally, women carry more fat" (Bennett n.d.).

Arnold tries to compare favorably the partial destruction of bodies that occurs in his SHC cases (in which limbs, large segments of bone, and other matter may remain, although that which does is rarely quantified or described scientifically) with the more complete destruction typical of crematories. But this is an apples-versus-oranges comparison at best. As Drysdale (1989) explains:

> In a crematorium you need high temperatures—around 1,300 degrees C, or even higher—to reduce the body to ash in a relatively short period of time. But it's a misconception to think you need those temperatures within a living room to reduce a body to ash in this way. You can produce local, high temperatures, by means of the wick effect and a combination of smouldering and flaming to reduce even bones to ash. At relatively low temperatures of 500 degrees C—and if given enough time—the bone will transform into something approaching a powder in composition.

It is interesting that the major proponents of SHC—Michael Harrison (*Fire from Heaven,* 1978), Jenny Randles and Peter Hough (*Spontaneous Human Combustion,* 1992), and Larry E. Arnold (*Ablaze!,* 1995)—are all popular writers who are credulous as to other paranormal claims. They stand in contrast to the physicists and chemists, the forensics specialists, and other scientists who question—on the evidence—the reality of spontaneous human combustion.

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MEDIA WATCH

C. EUGENE EMERY, JR.

CD-ROM Encyclopedias: How Does Their Coverage of Pseudoscience Topics Rate?

Looking for good information on the Bermuda Triangle? Don't expect to find it in the *Encyclopaedia Britannica's* CD-ROM. It talks about missing ships and aircraft but never mentions that the disappearances have usually been associated with storms or fabricated by authors.

Looking for an authoritative evaluation of dowsing? You won't find it in *Microsoft Encarta.* That CD-ROM encyclopedia simply says that many scientists have "dismissed belief in divining rods as superstition," giving the false impression that scientists have never seriously looked into the phenomenon.

General-interest encyclopedias are often the first place students turn to when they're looking for information on pseudoscientific topics. Most are easy to use, have an air of authority, and are widely available.

But when it comes to discussing areas that are of interest to SKEPTICAL INQUIRER readers, the encyclopedias aren't as informative as one might hope.

In fact, of the four general-interest CD-ROM encyclopedias I sampled, only one, *The Grolier Multimedia Encyclopedia,* offered reasonably responsible coverage of the supernatural. The encyclopedias were rated in three areas—whether a topic was mentioned, the quality of the skepticism, and the quantity of the skepticism. On this system, Grolier notched 19 points out of a possible high of 56. It was the only positive rating in the bunch.

The lowest score was garnered by the brand widely regarded as having the highest level of scholarship—Britannica. It rated –6 points out of a possible low score of –28.

Compton's Interactive Encyclopedia scored almost as poorly, with –5 points. Encarta got –1.

I looked at encyclopedias available on CD-ROM because (a) the content is similar, if not identical, to the print versions, (b) most give you a "search" option to help you locate references on a topic, and (c) the popularity of computers is making these encyclopedias popular as well. Some print encyclopedias are available on commercial services like Prodigy and America Online.

My informal rating system was based on several personal biases.

The first is that a good encyclopedia shouldn't ignore a pseudoscience topic. The student who can't find information on the Tunguska fireball or Kirlian photography in the encyclopedia may turn instead to the local bookstore, where science-based analyses are swamped by books with sensationalism and misinformation. Taking the elitist view that "people don't really believe in such nonsense" isn't a good excuse for ignoring a pseudoscience topic. Surveys show that a significant chunk of the population gives credence to pseudoscientific ideas.

Therefore, if a topic wasn't mentioned, the product was penalized by subtracting one point. I had hoped to have the survey include Uri Geller, Jeane Dixon, pyramid power, Atlantis (the New Age version), crop circles, iridology (diagnosing a wide variety of ills by looking at patterns in the colored portion of the eye), and near-death experiences, but I couldn't find a reference to any of these topics in any of the products.

My second bias is the belief that it is irresponsible for an encyclopedia to mince words when there's overwhelming evidence to show that a particular idea is wrong. To outline the creationist view that the universe was spawned in six twenty-four-hour days and simply label the idea as "controversial" is to ignore or belittle the extraordinarily overwhelming evidence that the concept is hogwash.

Third is my belief that a good reference source should explain *why* a pseudoscience idea is disputed or dismissed by scholars. Simply stating that "scientists don't believe it" is only a small step above declaring it "controversial." The

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scientific community has been wrong about plenty of things. The idea of continental drift, for example, was originally shot down by most geologists because gaps in our understanding of the earth provided good reasons for that skepticism. Providing a sense of the debate lets readers see whether an idea is completely outlandish or whether more research is likely to resolve the objections and turn the skeptics around.

Thus, I graded the entries on the quality of the skepticism. A "very skeptical" entry got three points for explaining the evidence, experiments, or studies that support a skeptical stance. Two points were bestowed on "mildly skeptical" articles that suggested there was some rationale for scientists' disbelief. One point went to articles with "token skepticism," where it simply stated that scientists don't believe it or the concept is unproven, without explaining why. A "pseudoskeptical" article, one that only suggested that the concept was controversial, got zero points. If there was no hint of controversy, the article got –1 point.

Finally, each article was assessed on the quantity of the skepticism expressed. One point was bestowed if the skeptical arguments seemed to get more attention than the information supporting the belief. One point was taken away if the assertions of the believers got more. No points were given if the article was too short to give much detail or if the skeptics got roughly an equal amount of space.

The rating system did not take into account encyclopedias that had long entries explaining a pseudoscience topic in detail, with the skepticism buried at the end.

Assessing the encyclopedias in this manner, I found that some general-purpose encyclopedias misinform more than they inform when it comes to scientifically assessing pseudoscience topics.

Here are some examples to give you a sense of how the different encyclopedias treat these topics:

The Bermuda Triangle: Britannica nearly promotes the legend, reporting for example that "some ships were discovered completely abandoned for no apparent reason; others transmitted no distress signals and were never seen or heard from again." After a sentence on missing aircraft, the article states: "However, wreckage has not been found, and some of the theories advanced to explain the repeated mysteries have been fanciful." Missing wreckage has often added to the mystery. Britannica gives no rational explanation for the legend. The briefer article in Compton's has suspiciously similar information. The Grolier entry at least mentions violent storms in the area and notes how the triangle's boundaries often vary "among writers trying to establish a Bermuda Triangle 'mystery.'"

Bigfoot, Yeti, etc.: Grolier says the most plausible explanation for the tracks of the abominable snowman "is that they are probably those of foxes or dogs, melted together by the heat of the Sun." Britannica says none of the evidence for Sasquatch has been verified and that "most scientists do not recognize the

CD-ROM continued on page 60

PSEUDOSCIENCE COVERAGE IN CD-ROM ENCYCLOPEDIAS

Topic	Grolier	Britannica	Encarta	Compton's
Astrology	1	1	1	0
Bermuda Triangle	3	0	-1*	1
Bigfoot, Yeti, etc.	2	0	-1*	-1
Creationism	1	0	2	-1
Dowsing	0	-2	-1	-1*
Ghosts	2	-2	-2	-2
Graphology (to analyze character)	1	-2	-2	-1
Homeopathy	0	-2	-1	-2
Loch Ness Monster	1	-2	1	-1*
Kirlian photography	3	-1*	1	-1*
Ouija	1	0	-1	-2
Parapsychology, clairvoyance, ESP, and other psychic powers	3	1	0	1
Subliminal advertising	1	-1	-1*	1
UFOs	0	4	4	4
TOTALS:	19	-6	-1	-5

* not mentioned

THREE GRADING CATEGORIES:

MENTION

- 0 Topic mentioned
- -1 Topic not mentioned

QUALITY OF SKEPTICISM

- 3 Very skeptical (explains evidence/experiments/studies for skepticism)
- 2 Mildly skeptical (states some reasons scientists don't believe)
- 1 Token skepticism (states that scientists don't believe, or the concept is unproven, without explaining why)
- 0 Pseudoskepticism (states that it's controversial, but the author may not have a clue as to why)
- -1 Zero skepticism expressed

QUANTITY OF SKEPTICISM

- 1 Skepticism given more space than belief
- 0 Skepticism and belief given equal time, or article too short to give much detail
- -1 Belief given more space than skepticism

A Strategy for Saving Science

To preserve our four-hundred-year commitment to a scientific worldview, we need our educated people to incorporate scientific thinking—the blend of curiosity and skepticism, the habit of critical questioning—into their very nature. Pioneering new teaching styles in science and math, carried out in cooperation with the liberal arts, can help achieve that.

LEON M. LEDERMAN

The support of scientific (and engineering) research in the U.S. has been steadily eroding for the past decade. There are three institutions that conduct research and all are in retreat. Industry, once the source of basic research with vast technological implications, has been retreating, with once-great laboratories now only shadows of their former splendor. Universities, both public and private, are losing money and are, through hiring freezes and general austerity, reducing their own contribution to match the reduced overhead collected from federal contracts. Opportunities for young faculty are thereby restricted. And the U.S. government, by far the largest contributor to basic research, has not kept pace with the consumer price index, not to mention the increases needed to continue research with ever more profound, challenging, and therefore more expensive measurements. Some of the results are the worsening of morale, the loss of young scientific recruits, and the

loss of new science as senior investigators spend increasing amounts of time searching for funding to keep their experiments going and their graduate students fed.

Superposed upon this state of gracelessness is the emergence of antiscience. Perhaps it has always been there but our explosive growth in communications changes things. More likely, antiscience waxes and wanes over the decades and we are in a waxing phase. And the antiscience comes in many flavors. "Parascience" or "junk science" includes astrologers, mystics, psychics, clairvoyants, fortune tellers, soothsayers, pyramidalists, pendulum dowsers, spiritualists, Israeli magicians, faith healers, UFO witnesses, ESP wizards. Whew! I suspect that most of them simply want to earn a dishonest dollar. I'm personally protected from astrology because I am a Gemini, and Geminis don't believe in astrology.

At a more sophisticated but equally dishonest level, in my opinion, are the late-night talk show liars, the now mostly jailed crowd of TV evangelists ("In the name of God" send money), and the TV networks (NBC is clearly in the lead here!) that prey on gullible viewers with their sensational "science-like" programs such as *Sightings, Paranormal Borderlands,* and the NBC special "The Mysterious Origins of Man." There are also credentialed scientists who, for a buck or a fat book advance, will provide a mathematical proof that God exists (there was an error in the proof!) or that life after death is wonderful enough to discourage you from exercising and eating oat bran. Included here are also the political gumshoes, the modern-day McCarthy sleuths, Congressional investigators like Congressman John Dingell. Then there were Senator William Proxmire's obscene "Golden Fleece" awards—cheap, ignorant publicity devices disguised as protection of the public purse. Let's not forget the self-appointed, tattletale peeping Toms disguised as whistle-blowers, who make their reputations as St. Georges, slaying the dragon of guilty-until-proven-innocent scientists.

Antiscience includes fundamentalists, creationists, cultists, the Religious Wrong—people who have a desperate need to believe; that's okay, but they have an equally desperate need to have you believe, too.

On another plane are the academicians who know no science, are proud of their ignorance, or who, mortified by this disconnectedness, generate contempt for the scientific enterprise. Others, swept into the antimodernist, end-of-objectivity collective, hold the goals of science to improve human society as not only unrealizable but as harmful. Surely the seemingly intractable problems of poverty, urban decay, crime, hatred, and general inequities seem irrelevant to how much we learn about the world. Certainly some of the more exotic views of this group, often at the edge of environmental, feminist, or animal rights movements, are rooted in a deep ignorance of the nature of science—what it does successfully and what it cannot do. If only we could get into their heads, expose them to the luminescent, emerging worldview of the physical and biological universes and the scientific magic that allows arrogant, passionate, revolutionary, imperfect humans—scientists—to create so magnificent an edifice as our ever-tentative but ever-evolving scientific knowledge base!

Now scientists are too often genetically infected optimists. We believe that problems, even seemingly intractable ones, can be addressed and solved. In any case, it is too late to retreat—the world is stuck with science and technology. The problem will be to design a strategy that maximizes the possibilities of using science and technology for the advance of humankind.

Now we have recently been reassured by the biennial NSF survey (National Science Board, *Science and Engineering Indicators—1996.* Washington, D.C.: U.S. Government Printing Office, 1996. [NSB 96–21]), which tells us that 70 percent of the American public loves us, thinks that scientists are among the most honorable of professionals, and believes that scientific research is a public good. And this number has been about the same for decades! So why the paranoia? Perhaps because antiscience has grown from 1 percent to 10 percent in the past decade or so. Perhaps because the 1 percent or 10 percent are congressmen, TV anchors, newspaper and magazine editors. Perhaps because many of the favorable 70 percent also watch dopey TV programs and listen to Rush Limbaugh. I don't know.

But, given this background, let me address a much deeper problem that underlies the success of antiscience in all of its forms and then suggest a strategy.

The deeper problem already well identified today is the problem of illiteracy, scientific illiteracy. If, as our experts tell us, the U.S. public is 93.8 percent scientifically illiterate (or 97.3 percent, depending on how one measures), then small wonder that our population is helpless before the onslaught of antiscience. Look at its advantages: antiscience is positive, authoritative, a haven for people who need safety and assurance, whereas science is hesitant, skeptical, even of—*especially of*—its own heritage. Not too much comfort there. And science demands some effort, a thought process. Antiscience says: Don't think! Believe! Trust us! We know! Science says: This is the best we can do here, the most we can say, note the error

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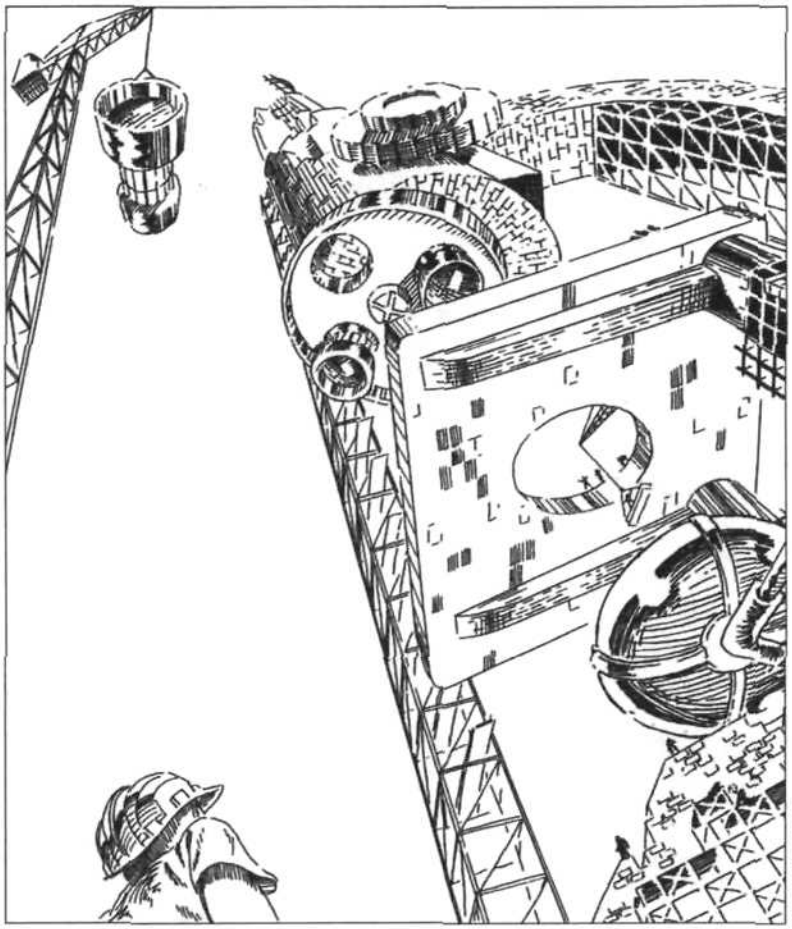
bars in our statements. . . . Not a fair fight.

Some nasty critics out there will point out that, much like religious organizations, science has its high priests who speak to each other in an esoteric and incomprehensible jargon and, when pressed, often invoke their gods with exotic names like Heisenberg, Schrödinger, Pasteur, and Einstein. However, the truth is that scientific authority exists to be overthrown, usually by very young revolutionaries, wielding logical bombs *but perhaps not too unlike the caricature of the* old Latin American country with a revolution every two weeks. The dramatic distinction, without penetrating to the details, is that scientific revolutions leave behind an improved knowledge base, a more comprehensive synthesis of what the laboratory has revealed.

Science has a four-hundred-year track record of progress, and this is measured in many ways: by the ever-widening domain in space, time, and conditions over which we can describe nature and make predictions. All the antiscience armies combined could not tell you the date of arrival of Halley's comet, whereas, science can give you the year, day, hour, and minute. Science's only competition in the prediction business are the long-haired, barefoot sandwich board carriers upon whose boards doomsday is spelled out to the microsecond.



Brad Marshall

It is science that has converted night to day, extended human longevity, cured many dread diseases, enabled people of very modest means to drive across continents, fly over oceans, and surf webs. Following the rules of antiscience (collectively) would condemn the vast majority of humans to extremes of poverty, starvation, and early death, allowing the priests and kings to inhabit their drafty castles, monasteries, and rectories. Science makes available to many the best of what mankind produces—jazz, rock, Beethoven's late quartets; Shakespeare, Leonardo da Vinci, and Michael Jordan. Antiscience sells some comfort in community and the dubious promise of eternity in a better place or potions that guarantee all kinds of joy through strength. However, the ultimate argument for not abandoning science to the dark forces of superstition, ignorance, and rigid belief systems is that the planet will not survive a population of upwards of ten billion people (by the year 2050?) without significant increases in our knowledge base, without new forms of energy, food production, and mechanisms for raising the standard of living of the poorest people.

But of course there are more serious tensions between science, with its associated technology, and society; and these problems are also well known: the distribution of scientific knowledge is uneven, and the benefits are far from uniformly spread. Yes, there is trickle down, but it's no fun to be poor in an affluent society even if you have a car and an average life span of sixty or more years. It is even less fun if you are trapped in a ghetto housing project, with your children in dysfunctional schools on dangerous streets; or if you live in a dirt-floor cabin in the Amazon but you can watch the good life on television. Even the most successful systems for harvesting the new wealth that science generates are still full of glaring inequities and filled with damages inflicted by greed and ignorance.

Like art, music, and literature, science creates (or reveals) beauty and wonder, but science and technology also create wealth and empowerment; control passes to government, *commerce, and ultimately, in principle, to the citizens of* democratic society. The challenge to problem solvers is how to prepare these elements to better manage this truly unimaginable power. So the thoughtful citizen, whether science illiterate or not, asks good questions. Isn't it science that generates the greenhouse gases, the acid rain, the new weapons, nuclear waste dumps? And doesn't technology mostly benefit the rich?

As we watch with bemusement or astonishment the incredible changes being brought about by developments of technology, we see the following major issues:

- A growth in short-termism with its consequent turning away from such investments as research and education.
- A prevailing ignorance about how science works.
- Excesses of science and technology deployments: industrial wastes, huge oil spills, toxic and radioactive debris, production of CO_2 . . .
- An exponential world population growth, a product of

the spread of our understanding of sanitation and health care.

• A failed educational system that has settled so long for low standards and lack of priority.

• Failed cities, crowded jails—as Roosevelt said in his famous 1932 presidential campaign speech, "One third of a nation is still ill-housed, ill-clothed, ill-fed."

• A commercial-TV wasteland that, for its easy profits, encourages mindlessness, violence, vacuous entertainment, and rampant consumerism. The exceptions only compound the frustration of what could be but isn't.

And now we can contemplate the wave of antiscience that pushes and pulls at our four-hundred-year-old commitment to science and rationality.

Almost like the drunk clutching the lamp post, scientists clutch *education* as a long-term solution to the problem. People have long placed faith in education—from Thales of Miletus to Richard Feynman of Brighton Beach, from the ancient prophets of biblical times to the profits of McGraw Hill, from King Solomon, who was the education king, to George Bush, the education president. Education is my approach, too. (It is now known as ".edu".) This almost unreasoned belief in education is our article of faith. Of course, there are a depressing number of examples to tell us that education does not inevitably produce ethical, virtuous, or even wise human beings. Creationists count heavily on their dozen or so Ph.D.'s, ignoring the fact that in a Ph.D.-counting contest they'd lose by over a thousand to one.

Today we have the Unabomber example, and whereas one can dismiss him as one individual having gone "over the edge," we also have the example of the Nazi scientists cheerfully participating in World War II concentration camp experiments; we have pillars of our society and graduates of our best colleges, the tobacco company executives whose products continue to generate more casualties than Hitler, Stalin, Ghengis Khan, and Napoleon put together. Articles in the *New York Times* and *Time* magazine on alternative medicines are discouraging. Facing the attacking antiscience forces, if I had the Unabomber on the left and the new Republican congressmen on the right, I would attack left. Why? The Unabomber only wanted to kill scientists and engineers, and he blew you up cleanly and humanely, whereas these others will starve and torture science to a slow and agonizing decay while their leaders murmur in your ear about how much they love basic research.

Still, we must not lose faith in education. It has to be done better, and the ambitious reforms I will review need to be organized and coordinated in some kind of new strategy, perhaps a general high-command center. We are still stuck with the age-old problem of how to teach ethics, morality, and social responsibility. However, "they are working on it" and I really do not know how else to proceed. Education must be the antidote to superstition, victimization, totalitarianism, bigotry. If it fails here and there we must make it better. We must work together—scientists, educators, psychologists, neuroscientists, linguists, and anthropologists—to make it better. The urgency of doing better and the common peril should make this easier. But education spans a K–16, or better, what I call a "K–100" domain—in other words, education spans a lifetime; it does not stop with formal, conventional education. The strategic vision is that if an ever-increasing number of our citizens could be taught to think scientifically, to understand the critical methods that have allowed scientists and engineers to create so much wealth, these citizens, in the democratic context, would be intolerant of sound bites and baloney, would insist on the proper allocation of national resources, would insist on a balance between operation and investment, would insist that the products of science and technology be deployed for the long-term benefit of the many, and would understand the role of *knowledge* in social, economic, and cultural contexts. They would be shielded from the philosophical con men and women and snake-oil purveyors. They would surely understand that education must count almost as much as deficit reduction in the future well-being of their children. Whereas in an earlier time, public understanding of science and technology was a cultural plus, in today's and tomorrow's world the stakes are much higher—nothing less than the preservation of our four-hundred-year-old commitment to a rational worldview.

There is, in our activities, the belief, perhaps born of despair, that the universal absorption of the scientific tradition, leavened by the liberal arts, will produce a new citizenship insistent on the application of science to fulfill the promise of progress.

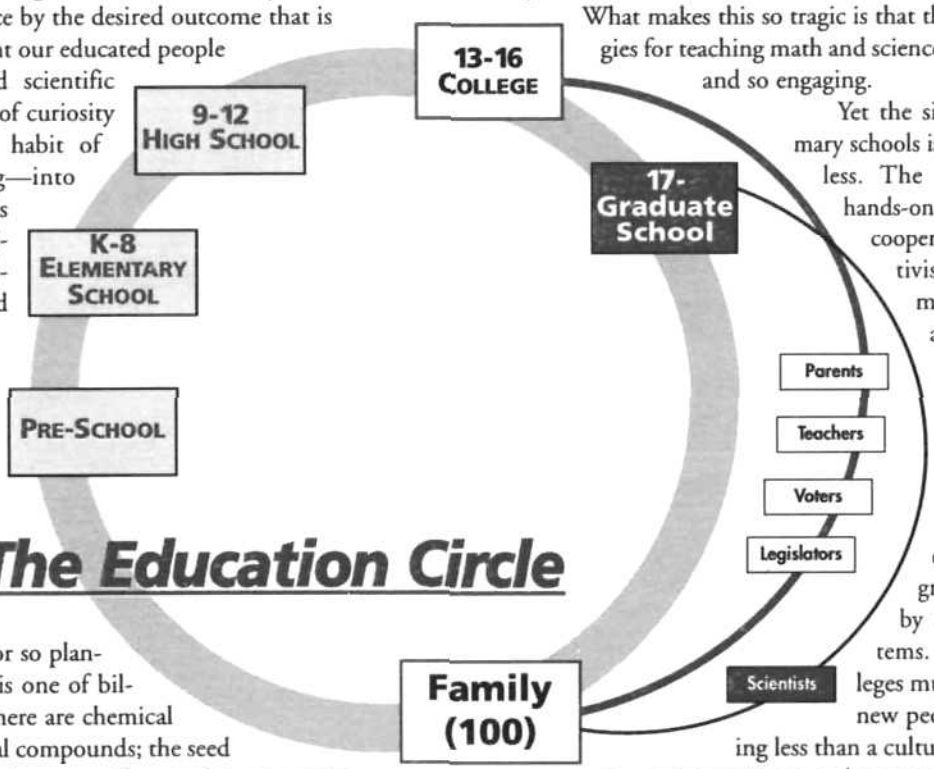
So let's look at our educational system with pithy comments on what is going on or should be going on in each of the conventional phases of education. It is here that I will restrict myself to my personal experiences and activities. I do, however, make the disclaimer that whereas I address science and math education, I realize that the social sciences, language, the arts, and literature are also in trouble and need urgent attention. I believe that the pioneering new teaching styles in math and science can have a strong influence on the rest of the liberal arts curriculum if we can only give teachers time to talk and learn from one another. In fact, I believe we must be allies and work together for a renaissance of education across all subjects.

I like to think about education as a kind of circle [see figure]. We learn in elementary electricity that if the circuit is not complete, but is cut somewhere, that no current will flow. Education is a circle because it starts, for example, with pre-school children, circles up to grades K through 8, continues to grades 9 through 12, whereupon some threads separate out—those who leave school—and others continue on to grades 13 through 16 or further; but they all circle around as part of the "general public," with the majority returning to the circle as parents of the pre-school children. So we have: preschool, K–8, 9–12, 13–16, and general public, which of course includes media professionals, politicians, doctors, lawyers, voters, and parents, and so around we go.

It is clear that we need a coordinating strategy that does not now exist. We must cover all arcs of the circle. We can improve the schools only if we get to parents, teachers, school boards, the media. We need a coordinated battle plan—I've already mentioned a central headquarters, perhaps festooned with electronic screens and nattily outfitted *Star Trek* crews—with

reports coming in from the front lines on where there is resistance, with reinforcements to dispatch to the places of need, with public information releases so that progress can be followed, with CNN coverage of frontline action in the war on ignorance, and with yellow ribbons tied outside the homes of teachers! *Most of all, we need a national priority for education.*

My personal opinions as we go around this education circle are dominated by the big IF. We can succeed *if* we motivate our teaching of science by the desired outcome that is all-important: we want our educated people to have incorporated scientific thinking—the blend of curiosity and skepticism, the habit of critical questioning—into their very nature. This should reduce the vulnerability of our citizens to quackery and misdirection. This should raise the level of debate where science, technology, and skepticism have a role. Of course, grade K–12 students must have a basic grasp of science content: Earth is one of nine or so planets; the solar system is one of billions in our galaxy; there are chemical elements and chemical compounds; the seed is father of the plant; there are cells, membranes, nerves, and muscles; there is a molecular basis of genes; and so on.



The Education Circle

Many of these details will be forgotten in the adult, but in a coherent, hopefully seamless K–12 experience, the student *should permanently absorb a grasp of general scientific principles* and a sense of why such principles—for example, conservation of energy—play so vital a role in science. The basic requirements of the educational system have been written down in some detail in new national standards that have been developed such as the Benchmarks issued by the American Association for the Advancement of Science in 1992 and the National Science Standard issued by the National Academy of Sciences in 1995. So we do have a consensus on what students should master. The new standards aim to: ". . . emphasize a new way of teaching and learning about science that reflects how science itself is done, emphasizing inquiry as a way of achieving knowledge and understanding about the world . . ." and ". . . strengthen many of the skills that people use everyday, like solving problems creatively, thinking critically, working cooperatively, in teams. . . ."

We obviously do not teach science and mathematics very well to children (K–8). The situation is so bad that we are indeed "a nation at risk." Incidentally, in this case, we are not much worse than most other nations of the world. The problem is easily traced to the poor training of primary school teachers, but also to constraints on supplies, preparation time, and above all, professional development. Although this seems to be an international invariant, the reasons why we do so poorly in the U.S. can be catalogued. Teachers have lost social status in the post–World War II era. Teacher training institutions have failed and largely continue to fail to produce elementary school teachers who can teach math and science. What makes this so tragic is that the new pedagogies for teaching math and science are so brilliant and so engaging.

Yet the situation in primary schools is far from hopeless. The buzzwords of hands-on, inquiry-based, cooperative, constructivist teaching of math and science are spreading from sea to *shining sea.* The problem is that professional development of teachers has been grossly neglected by the school systems. Teacher colleges must change. The new pedagogy is nothing less than a cultural change, and it requires patience and persistence. Acquiring scientific literacy must become a central aspect of K–8 education to match the central aspect that science and technology increasingly play in our society.

Consider grades 9–12, high schools. The science curriculum in 99 percent of U.S. high schools begins with biology, continues to chemistry and, for about 20 percent of U.S. students, ends with physics. This has been the way for one hundred years, and it is obviously backwards. As the science and math standards become part of state and local school policy, it will be clear that *all* students, whatever their futures, will need at least three years of math and three years of science. We have learned that to begin to understand chemistry, one needs to understand the construction and working of atoms and molecules. We have learned that DNA is the bridge between physics, chemistry, and biology. A few cities, including New York and Chicago, have adopted the policy of installing a three-year requirement. We must see to and encourage this for all schools, and there is some optimism here. This would be the time to rethink the high school curriculum: Science I, II, *and III, a coherent, integrated sequence which, at every stage,* makes continuous use of what has been learned, to enlarge the scope. Several promising programs are around, and one I am most interested in is project ARISE (American Renaissance in

Science Education), a loose coalition of scientists and educators from the National Academy of Sciences, the American Association for the Advancement of Science, and the National Science Teachers Association, and a few government agencies and universities. It seems to me that it makes sense to start with ninth-grade conceptual physics (very light on math, heavy on concepts), which would culminate in the development a model of the structure of atoms. Science II, mostly chemistry, would take over here and hand over students with a command of chemical reactions and molecule formation, ready for modern biology.

In such a sequence, we would include some history of science, some science in history and society, the interplay of science and technology, and the structure of such multidisciplinary subjects as earth science and ecology.

If our fifteen thousand high schools would adopt one or another sequence of three years for *all* students (subject to the national standards), in a decade we should have substantially raised the level of behavior of our general public. The impact on grades K–8 and the use of community colleges, trade schools, as well as the offerings in liberal arts colleges, would all have to change. Here again my assessment is optimistic. The resistance to change in the high schools must not be underestimated, but the virtues of reform are overwhelming. On our side we have the as-yet unorganized support of the science establishment. We have the customers for high school graduates in industry and government. And we have the support of perceptive educators. Give it ten years!

I will skip grades 13–16 except to make a plea, guaranteed to fall on resistant ears, that a two-year science requirement for nonscience and nonengineering students is really minimum. Certainly the standard "Rocks for Jocks" will no longer work for our ARISE generation high school graduates. It is here that critical examinations of antiscience can be made. It is also here that the moral and ethical obligations on science and technology can be discussed at a much deeper level.

Finally, let me comment on the "grade 17–100" students—John Q. Public in the wide spectrum of our citizens as they exist today: 97.3 percent scientifically illiterate; addicted to their PCs, CD-ROMs, digitized toothbrushes, Superbowls, and mindless sitcoms; and filled with a love for their children. We must reach them because they vote now, because they are the parents and school board members, because they produce NBC documentaries, because national and local and personal decisions increasingly involve science and technology. Here are some typical questions out of today's news:

- Should we ban cigarettes?
- Are silicone breast implants dangerous?
- Can peach pits cure cancer?
- Is there any good data on the efficacy of alternative medicines?
- Should our military continue to employ psychics?
- Are aliens kidnapping and molesting U.S. citizens?
- Should we put a tax on carbon emissions?
- What *is* the population crisis problem?
- Are humans influencing global climate change?
- Should we decriminalize drugs?
- How do we understand and control the information revolution?

Perhaps it is too idealistic to hope that a science-savvy public will be able to follow the scientific debates and to reasonably weigh the pros and cons of public policy decisions. Any approach to raising the level of the public's science savvy must be saturated with reality. Where do we start? Like Zsa Zsa Gabor's seventh husband, we ask: How do we make it interesting? Science needs all the help it can get from media professionals. Just consider the power of a prime time TV dramatic series that glues the viewers in their couches and teaches them some science. Such a program, its episodes cycling over the variety of research disciplines, could show scientists as humans (I know it's hard to believe), as often young, occasionally and increasingly female, as spanning the range of human qualities but as addressing scientific and technological problems (entertainingly apocalyptic) in the scientific spirit, demonstrating the essential qualities of skepticism and curiosity, insight, and imagination. Were it to catch on and become highly popular, its educational impact could be huge.

But approaches to public understanding have many more avenues. There is cable, and public television and radio (for example, Ira Flatow's *Science Friday* on NPR). There are op-ed opportunities like the corner of the *New York Times* that is usually rented by Mobil Oil. Occasionally, Henry Kendall's Union of Concerned Scientists writes good science stories as does *Scientific American*. And, as they said when a cruise ship full of lawyers sank in Lake Erie, "It's a start!" Let me challenge you to write a 600- to 800-word essay on your favorite science story. Make it lively and readable. Mail it to me, and I'll try hard to get it published.

In all of this, we should pay close attention to the professionals who have studied the history and the complexities of "public understanding."

My penultimate remark may not be necessary for this audience: raising the level of public understanding of science has clear objectives. The future is like navigating a sea with islands of disaster, islands of human fulfillment, and islands not yet explored. The steering of the ship cannot be left to captains who can't read the maps, nor should it be left to scientists or any special priesthood. History and our love and respect for democracy favors the selection of able representatives by all the literate and knowledgeable passengers, sensitized to the scientific spirit. The captain must also be wise, compassionate, visionary, and managerial (but, of course, not perfect!).

Finally, let's be clear on the difference between education and marketing. That a science-literate public would favor increasing science funding is not at all clear. Honest education may generate, will generate, as many critics as admirers of science. This is the kind of criticism that science needs to keep it sharp. Ethical and social responsibility at the highest level is essential to our future. The skepticism we so desperately want to instill in citizens may turn to skepticism about the usefulness or value of science. But I do believe most of us are willing to take our chances. □

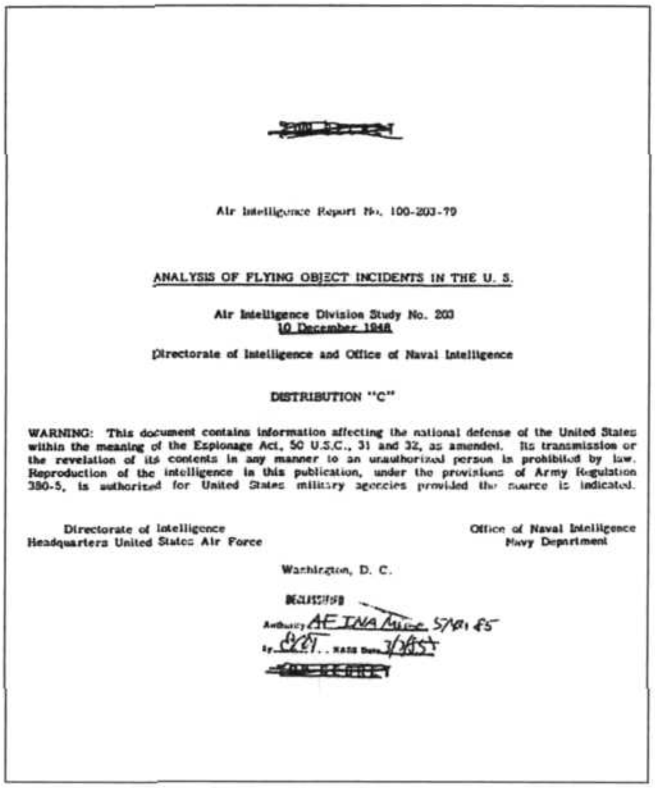
That's Entertainment! TV's UFO Coverup

Network television documentaries about UFOs have willfully ignored evidence that contradicts the pro-aliens theme.

PHILIP J. KLASS

Don't be surprised or shocked if you discover that a good friend—a well-educated, intelligent person—believes in UFOs, or that he or she suspects that the U.S. government recovered a crashed extraterrestrial craft and ET bodies in New Mexico and has kept them under wraps for nearly half a century. Don't be surprised if your respected friend, or a member of your own family, is convinced that ETs are abducting thousands of Americans and subjecting them to dreadful indignities.

The really surprising thing is that *you* do not believe in crashed saucers, alien abductions, and government coverup if you spend even a few hours every week watching TV. There are many TV shows that promote belief in the reality of UFOs, government coverup, and alien abductions. And they attract



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Air Intelligence Report No. 100-203-79

ANALYSIS OF FLYING OBJECT INCIDENTS IN THE U. S.

Air Intelligence Division Study No. 203
10 December 1948

Directorate of Intelligence and Office of Naval Intelligence

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very large audiences—typically tens of millions of viewers. Often they are broadcast a second, possibly even a third time.

TV has become the most pervasive means of influencing what people believe. That explains why companies spend billions of dollars every year on TV advertising to convince the public that Brand X beer tastes best, that you should eat Brand Y cereal, and that a Brand Z automobile is the world's best.

According to a recent survey reported in *Business Week* magazine, our children spend nearly twice as much time watching TV as they do in school.

Consider the problem that TV created for the Audi 5000 automobile and the claim that the car would suddenly accelerate and crash into the front of an owner's garage when the automatic transmission was in neutral. The Audi 5000 was introduced in 1978, and during the next four years only thirteen owners complained of a mysterious sudden acceleration incident. Then, in November 1986, CBS featured the alleged Audi 5000 problem on its popular *60 Minutes* show. During the next month, some fourteen hundred people claimed that their Audi 5000s had experienced sudden acceleration problems (P. J. O'Rourke, *Parliament of Whores,* Atlantic Monthly Press, 1991, pp. 86–7). Subsequent investigation by the National Transportation Safety Board revealed that the problem was the result of driver error—stepping on the accelerator when they intended to step on the brake.

Here's another example: several years ago, a man who claimed he had found a hypodermic needle in a Pepsi-Cola can became an instant celebrity when he appeared on network TV news to describe his amazing discovery. Within several weeks, roughly fifty other persons around the country claimed they too had discovered hypodermic needles in Pepsi-Cola cans. Investigation showed all these reports were spurious.

TV's brainwashing of the public on UFOs occurs not only on NBC's *Unsolved Mysteries* and Fox network's *Sightings,* but also on more respected programs such as CBS's *48 Hours* and ones hosted by CNN's Larry King.

Why pick on the TV networks? Cannot the same criticism be leveled at the print media? No. Generally, even cub reporters know that when writing an article on a controversial subject they should try to present both sides of the issue. If they fail to do so, their older and wiser managing editors will remind them. An article may devote 60 or 70 percent of its content to pro-UFO views, but with TV the pro-UFO content typically runs 95 percent—or higher.

TV news programs *do* try to offer viewers an even-handed treatment of controversial subjects. Thus it is not surprising that many viewers assume they are getting an equally balanced treatment in TV shows that follow the news, such as *Unsolved Mysteries* and *Sightings.* This is especially true when the show is CBS's *48 Hours,* hosted by news anchor Dan Rather.

This "schizophrenic" policy would be less troubling if such TV programs were required to carry a continuous disclaimer, such as "This program is providing you with a one-sided treatment of a controversial issue. It is intended solely to entertain you," or at least if such a disclaimer were voiced by the host at the beginning and the end of such a program. But alas, at best there is only a brief disclaimer which typically says: "The following is a controversial subject."

Consider a typical NBC *Unsolved Mysteries* show dealing with the Roswell "crashed-saucer" incident. The show, which aired Sept. 18, 1994, included an appearance by me. Prior to the taping of my interview, I gave the producer photocopies of once top-secret and secret Air Force documents that had never before been seen on TV and that provided important new evidence that a flying saucer had *not* crashed in New Mexico.

These documents, dating back to late 1948, revealed that if an ET craft was recovered from New Mexico in July 1947, nobody informed top Pentagon intelligence officials who should have been the first to know. One of these top-secret documents, dated December 10, 1948, more than a year and a half after the alleged recovery of an ET craft and "alien" bodies, showed that top Air Force and Navy intelligence officials then believed that UFOs might be Soviet spy vehicles.

When the hour-long *Unsolved Mysteries* show aired, I

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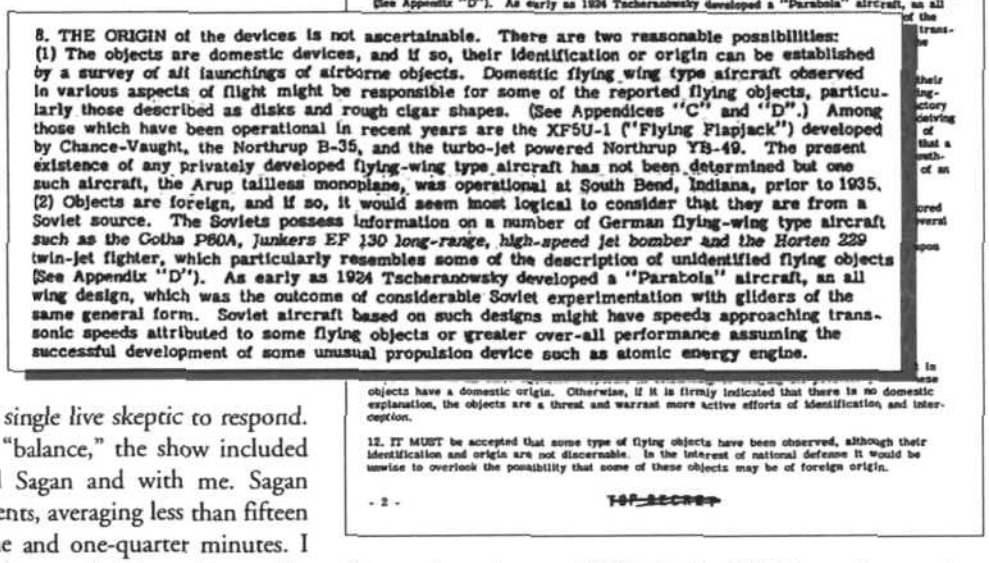
appeared for only twenty seconds to discuss the early history of the UFO era. Not one of the once top-secret and secret documents, which disproved the Roswell myth, or my taped references to these documents, was used.

On October 1, 1994, the famed Larry King aired a two-hour special program on the TNT cable network. It's title was "UFO Coverup? Live From Area 51." (Area 51 is part of an Air Force base in Nevada where new aircraft and weapons are *tested*. UFO *believers allege* that one can see alien spacecraft flying over the area and that the government has secret dealings and encounters with aliens there.)

Approximately one hour—half the two-hour program—was broadcast live from Nevada. For this hour, four pro-UFO guests were allowed to make wild claims, without a single live skeptic to respond. To give viewers the illusion of "balance," the show included pre-taped interviews with Carl Sagan and with me. Sagan appeared in five very brief segments, averaging less than fifteen seconds each, for a total of one and one-quarter minutes. I appeared in four brief segments for a total airtime of one and a half minutes.



8. THE ORIGIN of the devices is not ascertainable. There are two reasonable possibilities: (1) The objects are domestic devices, and if so, their identification or origin can be established by a survey of all launchings of airborne objects. Domestic flying wing type aircraft observed in various aspects of flight might be responsible for some of the reported flying objects, particularly those described as disks and rough cigar shapes. (See Appendices "C" and "D".) Among those which have been operational in recent years are the XF5U-1 ("Flying Flapjack") developed by Chance-Vaught, the Northrup B-35, and the turbo-jet powered Northrup YB-49. The present existence of any privately developed flying-wing type aircraft has not been determined but one such aircraft, the Arup tailless monoplane, was operational at South Bend, Indiana, prior to 1935. (2) Objects are foreign, and if so, it would seem most logical to consider that they are from a Soviet source. The Soviets possess information on a number of German flying-wing type aircraft such as the Gotha P60A, Junkers EF 130 long-range, high-speed jet bomber and the Horten 229 twin-jet fighter, which particularly resembles some of the description of unidentified flying objects (See Appendix "D"). As early as 1924 Tscheranowsky developed a "Parabola" aircraft, an all wing design, which was the outcome of considerable Soviet experimentation with gliders of the same general form. Soviet aircraft based on such designs might have speeds approaching transonic speeds attributed to some flying objects or greater over-all performance assuming the successful development of some unusual propulsion device such as atomic energy engine.

objects have a domestic origin. Otherwise, if it is firmly indicated that there is no domestic explanation, the objects are a threat and warrant more active efforts of identification and interception.

12. IT MUST be accepted that some type of flying objects have been observed, although their identification and origin are not discernable. In the interest of national defense it would be unwise to overlook the possibility that some of these objects may be of foreign origin.

- 2 -

So during the two-hour show, the audience was exposed to less than three minutes of skeptical views on UFOs, crashed saucers, and government coverup. And because Sagan and I were taped many weeks earlier, neither of us could respond to nonsense spouted by the four UFO promoters who appeared live for an hour.

Some weeks earlier, when I went to the studio for my taped interview for this Larry King show, I handed producer Tom Farmer photocopies of the same once top-secret and secret documents I had given to *Unsolved Mysteries*. Once again I stressed that these documents had never before appeared on any television show. Yet not one of these documents was shown during the two-hour program.

Near the end of the program, Larry King summed up the situation in the following words: "Crashed saucers. Who knows? But clearly the government is withholding something. . . ." In fact, it was Larry King and his producer who were withholding the hard data that would show that the government is not involved in a crashed-saucer coverup.

Larry King ended the program with these words: "We hope *that you learned a lot tonight and that you found it both entertaining* and informative at the same time."

If you were looking for a truly "informative" program on UFOs, you'd expect to find it on the *Science Frontiers* program broadcast on The Learning Channel, right? Wrong!

Last spring, The Learning Channel's *Science Frontiers* program aired a one-hour program titled "UFO." Not one of the many "UFO experts" interviewed on the program was a skeptic. The British producer sent a film crew to Washington—where I live—to interview pro-UFOlogist Fred Whiting, who was given nearly three minutes of airtime. Whiting assured the viewers: "There is indeed a coverup." But I was *not* invited to be interviewed.

In early 1994, I received a phone call from a producer of the CBS show *48 Hours*, saying they were producing a segment on the Roswell crashed saucer and would like to come down from New York in mid-April to interview me.

In late March 1994, I visited Roswell in connection with a new crashed-saucer book that was making its debut there. Not surprisingly, the CBS film crew from *48 Hours* was on hand and they did a brief interview with me. In an effort to inform the viewers of the 1948 top-secret document, I pulled it out of my pocket and held it up in front of the CBS camera. And I promised to provide the producer with more such documents, never before shown on TV, when they came to Washington for the more lengthy interview.

CBS never came to Washington for my interview. And when the show later aired, with Dan Rather as its host, CBS opted *not* to include any of the brief interview with me in Roswell—holding up the once top-secret document.

Young children, and their parents, will experience similar "*brainwashing*" *when they visit Disney World's new* "Tomorrowland" in Orlando. A new dynamic exhibit is called "Alien Encounters and Extra-TERRORestrial Experience." To encourage parents and children to visit the new UFO exhibit, in mid-March 1995 Walt Disney Inc. broadcast a one-hour TV show on ABC titled "Alien Encounters from New Tomorrow-

UFO Coverup continued on page 58

Scientific Consensus and Expert Testimony: Lessons from the Judas Priest Trial

Can a subliminal message induce someone to commit suicide? This was the central question at the Judas Priest trial.

TIMOTHY E. MOORE

The face of Jesus was "discovered" in a forkful of spaghetti in a Pizza Hut billboard advertisement in DeKalb County, Georgia, in May of 1991. Joyce Simpson said she was debating whether to quit her church choir as she was leaving a gas station when she felt compelled to look up. "And I saw Christ's face," she said (Guevara-Castro and Viele 1991). Subsequently, dozens of motorists claimed to have seen Jesus shrouded in spaghetti and tomato sauce on the chain's billboard. God works in mysterious ways, but this tactic seems unnecessarily convoluted. On the other hand, compared to being abducted by aliens, seeing a face in a blob of spaghetti is small potatoes.

Sometimes perceptual illusions or faulty reasoning can have more pernicious consequences. For example, in 1986 a

Philadelphia jury awarded a woman more than $900,000 in damages because she claimed her psychic powers had been damaged during a CAT scan conducted at Temple University Medical School (*New York Times*, March 29, 1986). Her complaint was supported by the "expert" testimony of a doctor. Unfounded fears are not unusual, but when they are accorded further esteem by a credulous judge or jury we risk surrender to the irrational. What the courts take seriously is believed to *be* serious by the common citizen. While science can supposedly provide some protection against litigious foolishness, sometimes science itself seems to be part of the problem.

How do scientific beliefs influence courtroom deliberations? More specifically, what happens to an extraordinary claim when it plays a pivotal role in a high-stakes criminal trial? Within the scientific community there are accepted methods and procedures for establishing the truth or falsity of an extravagant claim (Gardner 1981), but the courtroom is a different kind of forum. It is adversarial in nature. What happens to scientific consensus in court, especially if scientific information is distorted, misrepresented, or perhaps not science at all? Peter Huber has described what he calls "junk science" (Huber 1991), and according to Huber junk science may (and often *does*) wreak havoc with scientific integrity and with justice.

Cover of Judas Priest's 1978 album *Stained Class*. (Cover design: R. Szaybo. Photography: R. Kass.)

This article explores the issue of junk science in the context of a specific trial—the Judas Priest trial that unfolded in Reno, Nevada, in the summer of 1990. Two teenage boys, James Vance and Ray Belknap, had attempted suicide. At the time of the shootings, Belknap died instantly. Vance was severely injured but he lived, only to die of drug complications three years later. The plaintiffs (the boys' parents) alleged that subliminal messages hidden in the heavy metal rock music that Vance and Belknap listened to contributed to their suicidal impulse. This trial is interesting for a number of reasons. First, it provides a classic example of junk science. Second, the trial established a legal precedent that has already influenced the ruling in a similar subsequent suit. Third, it provides a good forum for illustrating some important and often misunderstood aspects of subliminal perception.

Judas Priest was a British heavy metal rock band—one of the first of that genre. Their popularity peaked in the mid-70s. The album in question (*Stained Class*) was produced in 1978; the shootings took place in December 1985. It was alleged that a particular subliminal phrase in one of their songs ("Better by You Better Than Me") on the album triggered a suicidal impulse. The phrase at issue was "Do It." In isolation, this phrase has little meaning unless there is some antecedent to which the "It" refers. Moreover, the antecedent could not have been anything that was audible on the record (or visible on the album cover), because such material would have been protected by the First Amendment. Consequently the plaintiffs were in the difficult position of having to acknowledge that the boys were suicidal to begin with, and that the subliminal phrase "Do It" triggered the already existing disposition.

First Amendment Protection and the Denial of Summary Judgment

The defendants denied any and all knowledge of subliminal messages, and they denied having engaged in any tricks or mischief during production of the record. Nevertheless, the case went to trial. The defense was unsuccessful in arguing that any and all speech (including subliminal speech) should enjoy First Amendment protection. In a pre-trial motion, Justice Jerry Carr Whitehead ruled that subliminal speech does *not* deserve protection because it does not perform any of the functions that free speech accomplishes. Since the recipient of a subliminal message is unaware of it, the message can't contribute to dialogue, the pursuit of truth, the marketplace of ideas, or personal autonomy. There is no information exchange. No arguments are possible if recipients are unaware of the message's presence. People also have a right, the judge added, to be free from unwanted speech. Since subliminal materials cannot be avoided, they constitute an invasion of privacy. For all these reasons, subliminals were not afforded First Amendment protection (*Vance v. Judas Priest* 1989b). This ruling makes logical sense *if* a subliminal message *could* have the power attributed to it by the plaintiffs. The plaintiffs thus achieved a major victory in getting the case to trial in the first place.

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While First Amendment protection has never been absolute, the exceptions have been narrow and carefully limited. Speech that is obscene, libelous, or an incitement to lawlessness is not protected by the First Amendment. Justice Whitehead's ruling provided another exception—subliminal speech. We may not have seen the last of trials concerning allegations about subliminal influences (Dee 1994). A few months after Judas Priest's acquittal, Michael Waller, the son of a Georgia minister, shot himself in the head while listening to Ozzy Osbourne's record *Suicide Solution*. His parents claimed that subliminal messages may have influenced his actions. The judge in that trial granted the summary judgment because the plaintiffs could not show that there was any subliminal material on the record. He noted, however, that if the plaintiffs had shown that subliminal content was present, the messages would *not* have received protection under the First Amendment because subliminal messages are, in principle, false, misleading or extremely limited in their social value (*Waller v. Osbourne* 1991). Justice Whitehead's ruling in the Judas Priest trial was cited to support his position.

Liability 'Science'

If a car accident causes severe injury or death, it may be more appealing and more comforting to the driver if the cause of the accident can be attributed to a mechanical defect rather than to operator error. It may also be more appealing and more lucrative to lawyers interested in liability. Liability science often assumes that every ill has a distant cause—often a technological cause. Food additives, environmental toxins, and mechanical defects have all been alleged culprits in liability suits within the last two decades. The Judas Priest suit was a product liability case. An allegedly defective product was placed on the market and it caused harm. According to Timothy Post, one of the plaintiffs' lawyers, the subliminal message triggered the suicides. The defense denied placing any subliminal messages, and further contended that subliminal stimuli are not capable of compelling any behaviors, let alone suicidal ones.

One of the threats to scientific integrity mentioned by Huber (1991) has to do with abandoning the usual scientific meaning of the term *causality*. From a scientific perspective, we typically want to understand a phenomenon by discovering all the causal factors that contribute to it. According to Huber, however, liability science has its own rules. Liability science likes to simplify matters. A specific potential cause is selected and other contributing factors are ignored. It is assumed that no other variables were operating except the one of interest. The standard scientific approach is abandoned. Multiple risks are disregarded—especially obvious, ubiquitous, taken-for-granted risks—and all attention is focused on remote and (perhaps) implausible causes that implicate negligence on the part of someone else.

There was some evidence of this approach—the tendency to subvert the meaning of causality—at the Judas Priest trial. In his final ruling, the judge explicitly stated "the deceased and their parents are not on trial. The court is not to judge the lives of the decedents or evaluate their families." (*Vance v. Judas Priest* 1990, 2–3). The plaintiffs were obliged, however, to acknowledge some degree of risk, otherwise the "Do It's" would have been meaningless. What were some of these risk factors? According to the clinical psychologist who testified for the defense, both boys had serious, long-term adjustment problems. Both were violent and abusive in their relationships. They felt socially alienated; they were emotionally distressed, often depressed, and impulsive. Vance once broke another student's jaw in a fight at school. Both had a history of drug abuse, petty crime, school failure, and unemployment. Family backgrounds were violent and punitive. Belknap had attempted suicide before and had expressed suicidal intentions. Just prior to the shootings, Belknap gave out some of his Christmas presents early and indicated a desire for his sister to name her baby after him if anything happened to him. Most of these factors were mentioned by the judge in his final ruling. They were included "reluctantly" to show that the deceased were at high suicide risk (see Litman and Farberow 1994). Was this a reasoned departure from the "subverted causality" that often typifies liability cases? Who can say? The concession may simply have been an artifact of the logical necessity for the plaintiffs to recognize the high-risk status of the boys. At any rate, multiple causes *were* recognized, albeit somewhat grudgingly. The judge stated that "[t]here exist other factors which explain the conduct of the deceased independent of the subliminal stimuli. . . . [t]he deceased had propensities which made them a high suicide risk" (*Vance v. Judas Priest* 1990, 31–32).

The Plaintiffs' Experts

The pursuit of isolated, distant, and mysterious causes for various mishaps sometimes results in a search for distant and mysterious experts. Experts are invited to provide support for the contentious claim. When courts are tolerant of a subverted sense of the meaning of causality, they may also be tolerant of fringe experts. There were several at this trial. One of them was Wilson Key. He is the man who pretty much single-handedly popularized the myth of subliminal advertising. He sees subliminal conspiracies everywhere (Key 1973, 1976, 1980, 1989), so it was not surprising that he was present to support the plaintiffs' claims. While Key provided extensive pre-trial testimony, his contribution to the actual trial was negligible. It is possible that he undermined his own credibility with the court by opining that subliminal messages could be found on Ritz crackers, the Sistine Chapel, Sears catalogues, and the NBC evening news. He also asserted that "science is pretty much what you can get away with at any point in time."

The most influential expert to testify for the plaintiffs was Howard Shevrin, whose credentials were unassailable. He has conducted research on subliminal influences for over twenty years and has a respectable track record of publications in peer-reviewed books and journals (e.g., Shevrin 1988). Shevrin's argument was that subliminal commands are especially potent because the recipient is unaware of their source and attributes the directive or the imperative to himself—to his own inner motivational state. While there is a certain logic to this, Shevrin was hard-pressed to describe any research that supported his

opinion. The argument also presupposes that a command or directive is *inherently compelling*—that because it is an imperative in a linguistic or syntactic sense, it compels compliance in a psychological sense. According to Shevrin, when we consciously experience a command, we can ignore or comply with commands as we see fit, but if the command is subliminal, it may become part of our ongoing stream of motives, feelings, and inner promptings. It can therefore add an increment to any current predisposition that may be present, such as suicide. The fallacy lies in assuming that an imperative message has some inherently motivating effect. His position also required the assumption that a suicidal disposition requires a trigger or precipitant in order to be acted on. This assumption does not square with the research literature on adolescent suicide (Maris 1981). Shevrin was nevertheless persuasive. He provided an apparently respectable conceptual framework for explaining how such a mysterious and almost magical force could operate.

The Defendants' Experts

Three experts were called by the defense: myself, Anthony Pratkanis (a professor of social psychology from the University of California at Santa Cruz), and Don Read (a cognitive psychologist from the University of Lethbridge). I testified about methodological and interpretational flaws in some specific investigations of subliminal auditory stimuli (e.g., Borgeat and Chaloult 1985; Borgeat, Elie, Chaloult, and Chabot 1985; Henley 1975) and about the dubious empirical foundation underlying psychodynamic constructs. It was my opinion that there was no scientific support for the proposition that subliminal directives could induce behaviors of any kind, let alone suicide. Pratkanis reiterated some of the main points of my testimony regarding the history of research on subliminal influence, and described a recently conducted experiment (since published) showing that subliminal self-help tapes were ineffective (Pratkanis, Eskenazi, and Greenwald 1994). He also expressed additional misgivings about the validity of the Borgeat studies—studies Shevrin had cited as supportive of his position. Pratkanis resisted the intimation by the plaintiffs' lawyers that scientific findings were not of an enduring nature—that what is known today may be abandoned and replaced by a new opinion tomorrow. Finally, Don Read provided an eloquent description of research on the comprehension and retention of reversed speech (see Vokey and Read 1985).

Scientific Opinion vs. Scientific Evidence

The judge may have been seduced by psychodynamics, but perhaps not entirely convinced. Although Shevrin was successful in helping obtain the exception to First Amendment protection, he did not prevail during the actual trial. The ruling about subliminal effects stated: "The scientific research presented does not establish that subliminal stimuli, even if perceived, may precipitate conduct of this magnitude. . . . [t]he strongest evidence presented at the trial showed no behavioral effects other than anxiety, distress or tension" (*Vance v. Judas Priest* 1990, 31). The judge's conclusion about subliminal effects is not too far from the consensus to be found among most cognitive psychologists. Well-established subliminal effects are rather modest in their magnitude and nature—semantic activation of single words under highly constrained conditions (see Holender 1986). To quote from a recent influential review: ". . . unconscious cognition is severely limited in its analytic capability" (Greenwald *1992, 775*).

At one point during pre-trial testimony, Bill Peterson (one of the defense counsels) asked Shevrin to describe the empirical basis for his opinion: "What experiments are you referring to when you say you're referring to a body of literature, experiments on which you base your conclusion that subliminal messages may be sufficient to induce suicidal behavior?"

"I'm basing my opinion, my expert judgment, on a corpus of literature, on hundreds of experiments," said Shevrin.

"Name one," said Mr. Peterson (*Vance v. Judas Priest* 1989a, 138-139).

Shevrin eventually alluded to three or four studies (e.g., Kupper and Gerard 1990; Silverman 1982; Smith, Spence, and Klein 1959)—none of which demonstrated anything remotely close to subliminal commands influencing motives. In fact, very few published studies have attempted to use subliminal directives, and those that have used them produced singularly uncompelling evidence for subliminal influences on intentionality (e.g., Zuckerman 1960; see Moore [1982] for commentary).

The argument also presupposes that a command or directive is *inherently compelling*—that because it is an imperative in a linguistic or syntactic sense, it compels compliance in a psychological sense.

Shevrin's position was supportive of the plaintiffs' claims. Moreover, if logically extended, it constitutes an endorsement of auditory subliminal self-help tapes. If Shevrin's position were valid, subliminal self-help tapes should be effective for a substantial number of people. Users are predisposed and some may even be preoccupied with changing their behavior in the direction of the affirmations on the tapes. Those messages should, therefore, according to Shevrin's logic, alter and increase the listeners' inner motives. There is ample evidence, however, that subliminal self-help tapes are therapeutically useless (Greenwald, Spangenberg, Pratkanis, and Eskenazi 1991; Merikle 1988; Merikle and Skanes 1992; Moore 1988; Pratkanis, Eskenazi, and Greenwald 1994; Russell, Rowe, and Smouse 1991).

While Shevrin's testimony may have been logical, it was not good science. The judge, to his credit, appears to have made a distinction between a scientific opinion based on personal conviction and the logic of psychodynamics, and one based on empirical support.

Pseudoscience

Up to this point, science has not fared badly. With respect to causality, the judge found that there were factors independent of the subliminal stimuli that made the decedents a high suicide risk. With respect to the scientific literature, he found that the research had not established that subliminal stimuli could have the sorts of effects postulated by the plaintiffs. There were other aspects of the case, however, in which scientific thinking fared less well. Pseudoscience sometimes plays a role in court because of dubious "experts" who are willing to attest to just about anything. In these situations, junk science appears in court because experts have been invited to educate the judge or jury. Another reason that junk science gets into court is because it *already resides* in court in the form of pre-existing beliefs about the phenomenon at issue.

With respect to the scientific literature, [the judge] found that the research had not established that subliminal stimuli could have the sorts of effects postulated by the plaintiffs.

The judge's beliefs about subliminal perception are reflected in his ruling that denied summary judgment and in his final judgment. In the latter he provided what he called a "history of subliminal stimuli." The title itself reveals some confusion. It is not the history of subliminal perception, nor the history of subliminal influences, but rather the history of subliminal stimuli. The difference is not irrelevant. Determining the subliminality of a stimulus requires some labor-intensive scientific analysis. The arbitrary and capricious use of the phrase "subliminal stimuli" by journalists (and some social scientists) has resulted in frequent reports of "subliminal" effects in the absence of any demonstration of subliminality.

What information formed the basis of the judge's beliefs about subliminal perception? The references contained in his history essay consisted of several articles or book chapters from law journals, written by lawyers. He also cited information obtained from: *Saturday Review, New York Times, Omni, Time, High Times,* and *TV Guide.* The law articles, plus many of the magazine articles, contain numerous references to James Vicary and Wilson Key. Key's expertise has already been described. Who was James Vicary? In September of 1957, James Vicary claimed to have conducted a study in Fort Lee, New Jersey, in which he projected the subliminal messages "Eat Popcorn" and "Drink Coke" onto a movie screen during movie showings to audiences (see Moore 1982; Pratkanis 1992; Rogers 1993). Initial press releases reported that over 45,000 people had been tested in this way and that on-site sales had increased dramatically. Five years later Vicary acknowledged that he had had only a small amount of data—too small to be meaningful. Soon after that he dropped out of sight completely. At best this so-called study was a shallow and meaningless empirical exercise. At worst, it was a complete fabrication (Rogers 1993). Media coverage was nevertheless heavy and continues to this day. Surveys have demonstrated that there is widespread belief in subliminal manipulation and that the techniques are "taught" in high school and college courses (Block and Vanden Bergh 1985; Synodinos 1988; Zanot, Pincus, and Lamp 1983).

Implicit, if not explicit, in both Vicary's alleged demonstration, as well as media descriptions of the phenomenon, is the assumption that invisible or inaudible stimuli are inevitably unconsciously perceived. Portions of the judge's ruling reflect this assumption. His historical review of subliminal stimuli is more a review of media coverage of the topic rather than a scientific history, let alone a recent scientific appraisal. This popular, simplified, and exaggerated notion of subliminal persuasion is reflected in some of the other rulings, and it is in these rulings that scientific truth fared less well. Here is what needed to be demonstrated by the plaintiffs:

1. An inaudible (but technically identifiable) "message" was physically present on the recording.
2. The message was deliberately placed there.
3. The message was subliminal.
4. The message contributed to the suicides.

As we have already seen, the judge rejected the fourth proposition, but what of the other three? The judge assumed that the technical presence of a "message" (item 1) was synonymous with its being subliminal (item 3). This assumption is the result of the mythological heritage of Vicary and all the media coverage since then. The judge's ruling stated that ". . . the 'Do It's' on the record were subliminal because they were only discernible after their location had been identified and after the sounds were isolated and amplified. The sounds would not be consciously discernible to the ordinary listener under normal listening conditions" (*Vance v. Judas Priest* 1990, 18). The problem is that sounds that are not consciously discernible are not necessarily unconsciously discernible either. Many stimuli are not consciously discernible because they fall outside the range of our sensory apparatus. Consequently they do not initiate *any* neurological activity—conscious *or* unconscious. The error consists of equating the physical presence of the signal with subliminality.

Physical Presence vs. Psychological Consequence

Empirical studies of subliminal perception indicate that, with rare exceptions, the phenomenon appears to be confined to a certain range of stimulus intensities (Cheesman and Merikle 1986). This range places the stimulus below a threshold of subjective or phenomenal awareness, but *above* an objective detection or discrimination threshold. In other words, subliminal perception is not perception in the absence of stimulus detection. It occurs when our introspective reports are at odds with or discrepant with objective measures of detection. It is not unusual for subjects to profess to be guessing or to claim ignorance of a stimulus' identity when they are nevertheless making use of stimulus information. What this means is that no amount of expensive hardware or analyses of the signal can tell us if a signal is subliminal. Subliminality can only be

determined by an analysis of the perceptual consequences of stimulation. Signal detection methods in which the human perceptual system is used as the measuring instrument might have provided a clearer picture of whether the recording in question actually contained a detectable message that could conceivably have influenced behavior (e.g., Merikle 1988; Moore 1995).

A physical analysis of the signal is not necessarily completely uninformative. Such an analysis could help determine the presence of a signal which might, after further analysis, turn out to be subliminal. The judge assumed that if an inaudible signal was present, that signal was therefore subliminal even though neither the plaintiffs nor the defense presented evidence establishing subliminality. It should be emphasized that even if subliminality had been established, it would not necessarily follow that the message would have the influence attributed to it by Shevrin. His claim, however, could have been obviated by the finding that the signal was not, in fact, subliminal.

Was the signal deliberately placed there? Who can say? The judge's opinion was that the signal at issue was simply a coincidental convergence of a guitar chord with an exhalation pattern. Under what circumstances could one confidently infer purposeful deception? Conceivably, the length and complexity of an inaudible signal might guide decisions about whether its placement was accidental or deliberate. Walt Disney Inc. was recently accused of inserting the "subliminal" directive "All good teenagers take off your clothes" into the animated family film *Aladdin*. At around the same time the letters S-E-X were alleged to have been surreptitiously embedded in a scene from *The Lion King* (*Globe & Mail*, Nov. 7, 1995). Walt Disney Inc. has emphatically denied attempting any kind of subliminal titillation.

In March of 1994, someone discovered that Jessica Rabbit had no underwear for a very short time during the animated movie *Who Framed Roger Rabbit?* (*Globe & Mail*, March 17, 1994). In this example, there were at least three offending frames—unnoticeable unless the tape is advanced frame by frame. Were they deliberately planted there for some nefarious reason, or were the artists just saving some ink or playing a practical joke? It's hard to know, but the physical presence of an uncovered Jessica tells us nothing about the perceptual or psychological consequences of her undressed state. It is probable that under normal viewing conditions the contents of the frames are completely and thoroughly masked by the subsequent material. In the absence of the appropriate tests, however, one cannot simply assert that stimuli are (or are not) subliminal. In none of these examples is it possible to know definitively if the signal or image was subliminal, nor if it was deliberately planted.

Perception is an active, constructive process. Consequently, people often see or hear what they are predisposed (or encouraged) to perceive (Vokey and Read 1985). A diligent search entailing the isolation and amplification of dozens of snippets from a three-minute heavy metal rock recording would probably yield some intelligible words or phrases that would not be intelligible under normal listening conditions. In fact, it would be surprising if a few such "discoveries" were not made. The fact that the signal in question on the *Stained Class* album was not contained on any particular track of the 24-track tape argues further against the possibility of deliberate chicanery.

Further Confusion

The two most credible witnesses testifying for the plaintiffs were, in the judge's opinion, Shevrin and Mrs. Rusk. Mrs. Rusk was a guidance counselor at Vance's school. Vance, the boy who survived the suicide attempt, was questioned about the circumstances of the shootings by Mrs. Rusk in the spring of 1986. Mrs. Rusk's testimony was that Vance said, "We got a message. It told us just Do It . . . It [the record] was giving us the message to just Do It." This statement reflects conscious awareness on Vance's part of the presence and nature of the "Do It" message. Recall that Shevrin's position was that the subliminal message "Do It" was influential precisely because it was subliminal. The boys were *unaware* of receiving the prompt from an external source and, therefore, misattributed its source or origin to their own inner motivation. These two pieces of testimony are logically contradictory. They cannot both be correct. If, as Shevrin claimed, the message was subliminal, the boys should have been oblivious to its presence and its meaning. It is the unconscious nature of the message which, according to Shevrin, affords it the exceptional influence he ascribed to it. On the other hand, if they could actually hear it, as Vance indicated to Mrs. Rusk, then the message was not, by definition, subliminal, and was thus (a) protected by the First Amendment, and (b) not especially influential. The judge seemed unaware of this logical conundrum: "This testimony [Mrs. Rusk's] gives support to the premise that both James and Raymond subliminally perceived 'Do It' from the record" (*Vance v. Judas Priest* 1990, 30). In fact, Mrs. Rusk's testimony *refutes* the notion that the signal was subliminal. Shevrin was well aware of this difficulty. When the plaintiffs' lawyers suggested to him that Mrs. Rusk's testimony supported the notion that the "message" had been retained in the boys' memories, he expressed concern that Mrs. Rusk may have been influenced by media reports, and/or that she was having trouble recalling what Vance had reported to her. Apparently, the plaintiffs' lawyers did not understand the logic of their own expert's testimony. At this point one wonders who was minding the store.

Defining 'Expertise'

At issue in this trial was the claim that a subliminal directive incited suicide. From a scientific perspective, this is an extraordinary and *prima facie* implausible proposition. There is not now, nor has there ever been, any reliable empirical evidence that subliminal stimulation can produce anything other than fairly brief and relatively inconsequential reactions. Further, there is no evidence whatsoever that subliminal directives can compel compliance, and no such evidence was presented at the trial. Perhaps with the help of the defendants' experts, the judge came to realize that subliminal directives do not have the influence attributed to them by the plaintiffs. A more thorough

grasp of the issue might have yielded a summary judgment, thereby precluding a long and expensive trial. By denying summary judgment, Justice Whitehead assumed the validity of the plaintiffs' central claim—namely, that subliminal messages can influence human motivation.

There have been numerous legal commentaries on the Judas Priest ruling. Most of the post-trial controversy has concerned the question of First Amendment protection for subliminal messages. If such surreptitious manipulation is ineffective, then First Amendment protection from it becomes moot. Judging from legal scholars' commentary on Justice Whitehead's rulings, his understanding of the scientific issues was no worse than the rest of the legal community's (cf. Blen 1992; Dee 1994; Locke 1991). Similar to the judge's description of subliminal stimulation, legal commentators' reviews contain copious references to Key, Vicary, and other nonscientists whose backgrounds are anything but scientific. Key's books constitute quintessential pseudoscience; they contain no citations, no references, and no documentation for any of his proclamations. While Key's testimony *per se* does not appear to have been of much significance at the trial, his extravagant and well-publicized claims had had twenty years to infiltrate the North American psyche (including the legal profession's), where scientific literacy is not a dominant feature (Burnham 1987).

In the final analysis, however, it was not the obvious pseudoscience that misled the court as much as the misleading opinions of the well-qualified expert—Shevrin. His views, while imaginative and logical, were anomalous with prevailing scientific understanding of the phenomenon at hand. A long résumé and a prestigious affiliation are no guarantee of a scientifically valid opinion. An expert whose testimony is unique, idiosyncratic, and unconfirmed by the broader scientific community is not educating the court in the way that *Frye v. United States* (1923) intended or that more recent rulings have encouraged (*Daubert v. Merrell Dow Pharmaceuticals* 1993; *R. v. Mohan* 1994). These recent rulings have emphasized the need for expert testimony to be reasonably well grounded in theories, methods, and procedures that have been accepted and validated by other scientists in the same field. It is not at all clear that Shevrin's testimony met this standard. It *is* clear, however, that the courts are generally ill-prepared to meet the challenge of evaluating the scientific validity of expert evidence (Miller, Rein, and Baily 1994), especially in the social sciences (Richardson, Ginsburg, Gatowski, and Dobbin 1995). A rigorous application of *Daubert*'s admissibility criteria might well disallow *any* testimony based on Freudian principles because of its inherently unfalsifiable nature (Crews 1995). The need for systematic judicial education on scientific principles is now a recognized priority. Eventually, improved scientific understanding will result in more equitable court rulings. In the meantime, as long as the legal community's scientific literacy skills are so little able to permit distinctions between sense and nonsense, the public will continue to be entertained by (and foot the bill for) trials like that of *Vance v. Judas Priest.*

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Judas Priest continued on page 60

The Dogon People Revisited

The 1970s claim that the Dogon tribespeople of Africa had extraordinary astronomical knowledge has been revived, amplified, and widely disseminated in recent years. Here is a new examination and evaluation.

BERNARD R. ORTIZ de MONTELLANO

In 1976 Robert Temple published *The Sirius Mystery,* claiming that the extraordinary astronomical knowledge of the ancient Egyptians and the Dogon tribespeople of Mali[1] was due to visitations five thousand or more years ago from inhabitants of the Sirius star system. These claims were addressed then in an article in SKEPTICAL INQUIRER (Ridpath 1978). Since that time, however, the Afrocentrist movement has revived and expanded claims about the Dogon's astronomical knowledge (Adams 1983a, 1983b, 1990; Van Sertima 1983; see also Ortiz de Montellano 1991), and they have been naively parroted in more mainline publications (Gebre-Egziabher 1993/1994; Harding 1991). Adams (1990, 60) briefly presents the more recent claims about the Dogon:

> They knew of the rings of Saturn, and the moons of Jupiter, the spiral structure of the Milky Way, where our star system lies. They claimed that billions of stars spiral in space like the circulation of blood in the human body. . . . Perhaps the most remarkable facet of their knowledge is their knowing intricate details of the Sirius star system, which presently can only be detected with powerful telescopes. The Dogon knew of the white

dwarf companion star of Sirius, the brightest star in the sky. They knew its approximate mass ("it is composed of 'sagala,' an extremely heavy, dense metal such that all the earthly beings combined cannot lift it"), its orbital period (50 years), and its axial rotation period (one year). Furthermore, they knew of a third star that orbits Sirius and its planet [*sic*]. The X ray telescope aboard the Einstein Orbiting Observatory recently confirmed the existence of the third star.[2] The Dogon with no apparent instrument at their disposal, appear to have known these facts for at least 500 years.

Claims that the Dogon have known these things for at least seven hundred years (not five hundred) and that the ancient Egyptians also possessed this knowledge have been made by Adams (1983a) and endorsed by Van Sertima (1983). The sole source of this information about Dogon astronomical knowledge is the research of two French anthropologists, Marcel Griaule and Germaine Dieterlen (1950, 1965), and more directly the book by Temple (1976).

Griaule and Dieterlen, who studied the Dogon from 1931 to 1952, describe a world renovation ceremony called *sigui.* This ceremony is associated with the bright star Sirius A (*sigu tolo* or "star of Sigui")[3] and is held by the Dogon every sixty years. According to Griaule and Dieterlen, the Dogon also name a companion star, *po tolo* or "Digitaria star" (allegedly Sirius B), and describe its density and rotational characteristics. Griaule and Dieterlen do not attempt to explain how the Dogon could know this about a star that cannot be seen without a telescope, and they make no claims about the antiquity of this information or of a connection with ancient Egypt. It was Temple (1976, 203–227) who argued that the Dogon learned all this from amphibious beings from a superior civilization in the Sirius system.[4]

Stars are rated on a visibility scale that differs by a factor of 2.5 brightness per unit. The higher the positive number on the scale, the dimmer the star. Adams (1983b) claims, without any reference, in regard to viewing stars with the naked eye, that under optimum conditions people with blue-green eyes can see stars of 6.5 magnitude, but that dark-eyed, dark-skinned people can see stars of up to 8.1. The very bright Sirius A has a magnitude of –1.47, while Sirius B has a magnitude of 8.7 (Allen 1973, 235). The canonical limit of visibility is 6, although a few exceptional people, with lifelong training, can achieve 7.8 from high mountains (Schaefer 1995). This maximum human performance is still 2.26 times less than would be needed for naked-eye observation of Sirius B. Even if Sirius B were bright enough to be seen, it could not be distinguished by a naked eye because it is too close to Sirius A. The average separation between Sirius A and B is 9.5 seconds of arc (Allen 1973, 240) with a maximum separation of 11 seconds. However, a person with 20/20 vision can only distinguish two points of light that are at least 42 seconds apart, in other words, four times the separation of Sirius A and B (Schaefer 1995).

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Adams (1983a), based on Temple, argues that the ancient Egyptians had telescopes that enabled them to see Sirius B: "The Russians have recently discovered a crystal lens, perfectly spherical and of great precision, used in ancient Egypt.[5] It is a short and simple step to place one lens in front of another to make a basic telescope, and chances are that it could have happened and many times." This is an example of a type of reasoning described by Mary Lefkowitz (1993), referring to Martin Bernal's claims of massive Egyptian influence on Greece in *Black Athena* (Bernal 1987): "Because something is possible, it can be considered probable, or even actual *si potest esse, est.*" Adams (1983a, 1983b) and Van Sertima (1983) are even less cautious and use the following chain of reasoning: If it is conceivable, it is possible, it is probable—it is true. In fact, what they claim is impossible. Even if the Egyptian telescope existed, it would not suffice. The glare due to Sirius A requires the use of at least a 5-inch telescope to see Sirius B at its maximum separation; at its closest approach, about half the time, a minimum of a 100-inch telescope is needed (Schaefer 1991, 1995). The first sighting of Sirius B in 1844 required an 18-inch refractor telescope, the largest in the world at the time (Krupp 1991, 223).

Adams's repeated claims that the Dogon's supposed knowledge of Sirius B goes back seven hundred years are equally devoid of evidence. Adams's (1983a, 38) sole proof is the following statement given without attribution or citation: "A wooden mask called the *kanaga,* used by the Dogon to celebrate the Sirius-related Sigui ceremony, is among the archaeological finds that indicate their preoccupation with this star for at least 700 years." Adams's source is actually Griaule and Dieterlen (1950; Temple 1976, 37–38). The *kanaga* mask represents a cranelike bird, the bustard, and is connected to the Dogon creator-god Amma (Griaule 1938, 470). The dating of the *sigui* ceremony actually involves a *different* set of enormous wooden masks that are not worn but kept in protected shelters. These masks have not been carbon-dated, and their true age is not known. Griaule (1938) extrapolated the age of the masks by counting the number of masks in shelters and multiplying by sixty years per mask because a new mask was made for each sixty-year *sigui* ceremony. Most shelters had three or four masks, taking the ceremony back to A.D. 1720–1760 (Griaule 1938, 242–244; Temple 1976, 38). A single location had eight masks, the remains of another, and three piles of dust, which Griaule (1938, 245) interpreted as possibly three additional masks. This shaky hypothetical extrapolation is the sole evidence dating the *sigui* ceremony to A.D. 1300. Furthermore, it tells us nothing concerning knowledge of Sirius B, the invisible dwarf star, for the *sigui* ceremony is associated with Sirius A.

In fact, the entire Dogon question may be futile to theorize because Griaule's original data, on which this whole edifice is built, is very questionable. His methodology, with its declared intent to redeem African thought, its formal interviews with a single informant through an interpreter, and the absence of texts in the Dogon language, has been criticized for years (Goody 1967; Douglas 1968; Lettens 1971; Clifford 1983).

Even a sympathetic reviewer (Roberts 1987/1988), who believes that Sirius and its two companions are important components of Dogon thought, feels that the actual existence of Sirius B is purely coincidental: "It is equally clear that the first companion of Sirius (Po Tolo) as recognized by the Dogon is *not* the companion (Sirius B) recognized by Western astronomers. . . . The two companion stars that the Dogon recognize are elements of a particular cosmology that would exist even if Sirius B did not. That Sirius has a second companion for Dogon, which has never been discovered or presumed to exist by Western astronomers, should make this *point obvious.*"

Recently, a Belgian anthropologist, Walter van Beek (1991), who has spent eleven years among the Dogon, pointed out that Griaule's data is unique:

> Is Sirius a double star? The ethnographic facts are quite straightforward. The Dogon of course, know Sirius as a star (it is after all the brightest star in the sky). . . . Knowledge of the stars is not important either in daily life or in ritual. The position of the sun and the phases of the moon are more pertinent for Dogon reckoning. No Dogon outside of the circle of Griaule's informants had ever heard of *sigu tolo* or *po tolo*. . . . Most important, no one, even within the circle of Griaule informants, had ever heard or understood that Sirius was a double star (or according to *Renard Pâle,*[6] even a triple one, with B and C orbiting A). Consequently, the purported knowledge of the mass of Sirius B or the orbiting time was absent.

Van Beek points out that Griaule's data was developed in long, intense sessions with one primary informant, Ambara. In this process, Van Beek argues, Griaule probably reinterpreted *statements from his informant in the light of his own knowledge* about Sirius and its heavy companion, which had been much in the news at the time he began his field work. In turn, the Dogon would have accepted his analysis as if it were theirs because Griaule was extremely respected and liked, and because the Dogon culture places enormous importance on consensus and on avoiding contradictions (Van Beek 1991, 152–155). As an example of the process, Van Beek points out a Dogon tale that explains the differences between white people and the Dogon, but which, in fact, is taken from the Bible. "Thus *the story of the drunken Noah [Genesis 9, 21–27]* has found its way into the stories of these Dogon, who emphatically denied that this was a 'white' story." Traditionalists and Christians unanimously declared it to be Dogon: it belonged to the *tem* (collective knowledge). In many other instances the process was discernible: foreign elements were adopted and in a single generation became "traditional."

It might be argued that the knowledge given to Griaule was secret and known only to a few, including Ambara. Van Beek (1991) points out that "neither the myths nor the song texts—*though they are sacred—are secret. In fact, the tem is public* knowledge." Van Beek argues, given the fact that he cannot find traces of Griaule's data that, "The question is then, how secret secrets can be and yet be part and parcel of a culture. As shared meaning is a crucial aspect of any definition of culture,

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a secret not shared is not cultural, while one shared by very few is by definition marginal. . . . Thus, if the secrets revealed to Griaule are part of Dogon culture, one should be able to retrace them to some extent."

Jacky Boujou (1991), an anthropologist with ten years of experience with the Dogon, is in complete agreement with Van Beek: "I am struck by the degree to which Van Beek's analyses coincide with those I have gradually arrived at. . . . The third period [of Griaule and Dieterlen's research] is represented by the *Renard Pâle,*[7] which remains altogether strange and entirely unverifiable in the field, whatever Dogon region investigated. . . . I would underline the obvious desire of the Dogon for collective harmony and consensus that is striking to the participant observer."

Paul Lane (1991), another anthropologist with fieldwork among the Dogon, agrees: "Many of van Beek's substantive claims come to me as no surprise. Thus, for instance, although the objectives of my research in the Sanga region in the early 1980s were quite different, along with van Beek I found little evidence for the complex but nonetheless allegedly unified symbolic ordering of daily life described by Griaule."

Sagan (1980, 81–87) and Brecher (1979, 110) have proposed that the information about the discovery of Sirius B and its characteristics was told to the Dogon by another European prior to Griaule's fieldwork. Although derided by Van Sertima (1983, 13) and Adams (1983a, 37) this explanation, as the one given by Van Beek, is plausible and does not require extraterrestrials or mythical telescopes.

Adams, unlike Temple, does not provide any explanation for Dogon knowledge, although one is current in the Afrocentric circles in which he runs.[8] Frances Welsing (1987, 1991) and Adams (1987, 1988) argue that melanin has the ability to pick up all kinds of energy frequencies. Welsing (1987) further claims that the Dogon, by virtue of their melanin, are able to pick up vibrations from Sirius B as if they possessed infrared telescopes.[9] Welsing also claims that melanin gives ancient Egyptians and other blacks extrasensory perception, psi, and the ability to foretell the future. This explanation of an extraordinary claim is also not supported by any evidence (Ortiz de Montellano 1993).

Notes

1. The Dogon live near Bandiagara, about 300 kilometers south of Timbuktu, Mali, in western Africa (Ridpath 1978).

2. The paper cited as evidence for this (Chlebowski, Halpern, and Steiner 1981) does not claim that the X-ray-emitting dwarf 9' south of Sirius is a third companion. This star is, actually, 37 times farther from the Earth (325 light years) than is Sirius (8.7 light years). Lindenblad (1973) deliberately searched for a third component in the Sirius system and found none.

3. The bright star Sirius is also referred to as "Sirius A," with its dense companion being "Sirius B." The *sigui* ceremony deals with Sirius A, which everyone agrees is known to the Dogon. It is, after all, the brightest star in the sky. It is also known as the "Dog Star."

4. These space travelers were very ill-informed; Jupiter has fourteen moons, not four, as they supposedly told the Dogon (Brecher 1979).

5. A sphere would be useless as a lens because the focal length would be extremely short, and because the image produced would be greatly distorted by spherical and chromatic aberration (Muirden 1969, 6–7). In order to focus light adequately, the lens should be either concave or convex. The sole evidence given for this Russian discovery is a citation to a journalist, Peter Tompkins (1978, 219). The academic credibility and accuracy of Tompkins can be judged by his coauthorship with Christopher Bird (Tompkins and Bird 1973) of a book that claims plants can speak to people. In turn, Tompkins's sole evidence for the Russian discovery is a reference to an obscure Italian publication ("Peter Kolosimo in *Terra Senza Tempo* published in Milan in 1969") that is not listed in the bibliography of Tompkins's book. The claim can be found in the translated version (Kolosimo 1973, 95). In the book, Kolosimo, who is even less critical than Erich von Däniken, claims that both Atlantis and Lemuria existed and were the possible sources for this advanced Egyptian technology. He also postulates that visitors from outer space have visited Earth. The Egyptian telescopes turn out to be quite evanescent.

6. See Griaule and Dieterlen 1965.

7. This book (Griaule and Dieterlen 1965) represents the third and final period of Griaule and Dieterlen's writing on the Sirius myth among the Dogon.

8. A number of Afrocentrists, whom I have labeled as melanists, propose that melanin has extraordinary properties, which, in turn, make black people biologically superior in intellect, morals, and spirituality to white people (Ortiz de Montellano 1993).

9. Even this far-fetched claim is not applicable to Sirius B. Sirius B is too hot (22,000°K). Most of its radiation is emitted in the far ultraviolet, and little is emitted in the infrared (Seeds 1988, 137, 195).

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Cosmic Menagerie: Some Underpublicized Truths about the Constellations

The stars in our night sky are only a few thousand dots of light, but since ancient times people have been mentally connecting the dots to create a cosmic zoo. But don't look to them to tell you about your personal life or fortune.

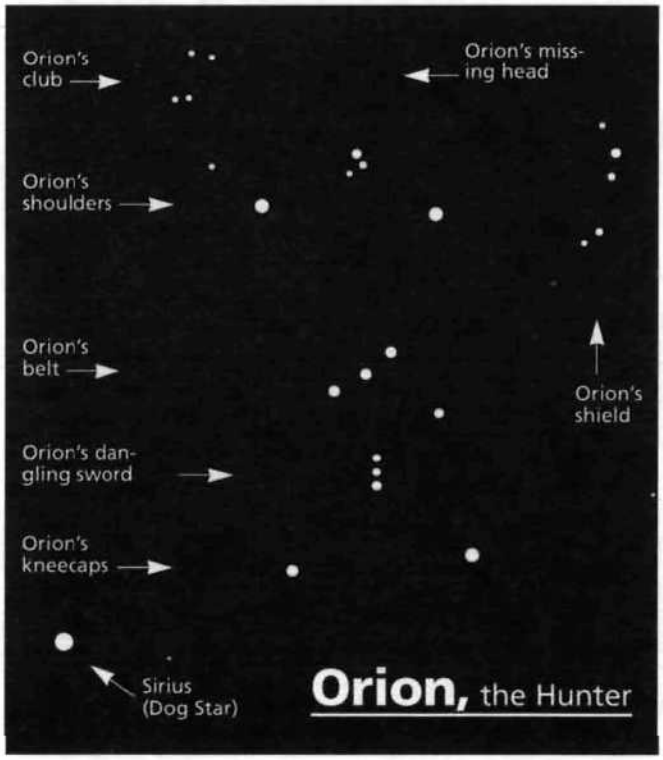
NEIL DEGRASSE TYSON

There are eighty-eight keys in a piano and there are eighty-eight constellations in the sky. The eighty-eight piano keys make music. The eighty-eight constellations make a zoo. The tally: one insect, two crustaceans, five fishes (with a pair among them), five reptiles, nine birds, three women, twelve men (with twins among them), five canines (inclusive of a hunting duo), fourteen other mammals, five mythical-magical creatures, and thirty inanimate objects that include three boat parts, ten scientific instruments, one musical instrument, two crowns, a flat-topped mountain, somebody's hair, and a river.

To supplement your nighttime viewing, what follows is some little-known information that a well-informed, skeptical stargazer should know:

From a species point of view, the following constellations are in the record book of celestial creatures:

Tallest: Camelopardalis, the Giraffe
Most Massive: Hydra, the Whale
Smallest/Lightest: Musca, the Fly
Most Poisonous: Scorpius, the Scorpion
Fastest: Pegasus, the Winged Horse
Strongest: Hercules
Prettiest: Pavo, the Peacock
Ugliest: Medusa's snake-ensnarled bloody severed head as displayed by Perseus



From a connect-the-dots point of view, the constellation Orion has the rare combination of large size, bright stars, and an outline that resembles the hunter he is purported to be. His neck, shoulders, waist (belt), knees, sword, and shield are all clearly defined. Unfortunately, he hasn't much of a head—there is a big empty space above his neck. There is some controversy about whether Orion is left-handed or right-handed. Early drawings and woodcuts from the fifteenth, sixteenth, and seventeenth centuries show the back of Orion's head, his rear end, and the rest of his loin-cloth-draped body as he faces away from you. The star pattern requires that he wield his wooden battle club with his left hand, which makes Orion the world's largest and most famous lefty. Illustrated globes of the celestial sphere from the same period (an excellent collection may be found at the Musée National des Techniques, Paris) also depict Orion from the rear, even though the constellations are intended to be viewed from the "other side" of the sky, and thus should be drawn in reverse. More recent sketches of Orion (probably drawn by righties) show him facing you as he wields his club in his right hand.

Orion's sword is commonly illustrated over a short string of stars that hangs from his belt and dangles between his legs. I have never hunted with a sword and club, but of all the places on my anatomy that I might carry a sword, it seems to me that between the legs would be low on my list. Such is the cost of connecting the dots.

The stars in Pegasus, the winged horse, are not quite as bright as those in Orion, but they are just as majestic. Clearly visible are four stars of a "Great Square" that form the horse's body. Front legs drape below it. Extending forward is a slightly bent line of stars that resembles the curve of a horse's neck and head. You must rely on your imagination for its wings and the rest of Pegasus because the constellation Andromeda occupies the region that would otherwise complete the horse's ass. By coincidence of configuration, the interior of the Great Square of Pegasus is remarkably devoid of visible stars—the square is as impressive for its near-square geometry as it is for its emptiness. And unbeknownst to our empty-bellied, winged steed, Pegasus flies through the sky upside down as viewed by residents of the northern hemisphere.

The square of Pegasus is sufficiently impressive that if the task of naming the constellations had been the duty of late-twentieth-century Americans, then you can bet the square would have been called the "Great Television" in the sky, and of course Orion would have been named "Elvis."

The most boring constellation in the sky is no doubt Triangulum Australis, the Southern Triangle. A detailed photograph of its three brightest stars shows—you guessed it—a triangle. Since nearly any three stars in the sky form a triangle, Triangulum gets the award for the most unimaginative constellation name. To be fair to Triangulum, there are several dimmer stars in and around the triangle. But since the constellation is simply the "Southern Triangle," these stars do not participate in the designated pattern.

The greatest stretch of the imagination occurs with Apus, in the southern hemisphere. It is a constellation with a few prominent stars near the south celestial pole that is supposed to be a fully plumed bird of paradise.

Some stars grow in the mind. The most famous of these is Polaris, the North Star. In an informal poll I once asked passers-by, "What is the brightest star in the nighttime sky?"

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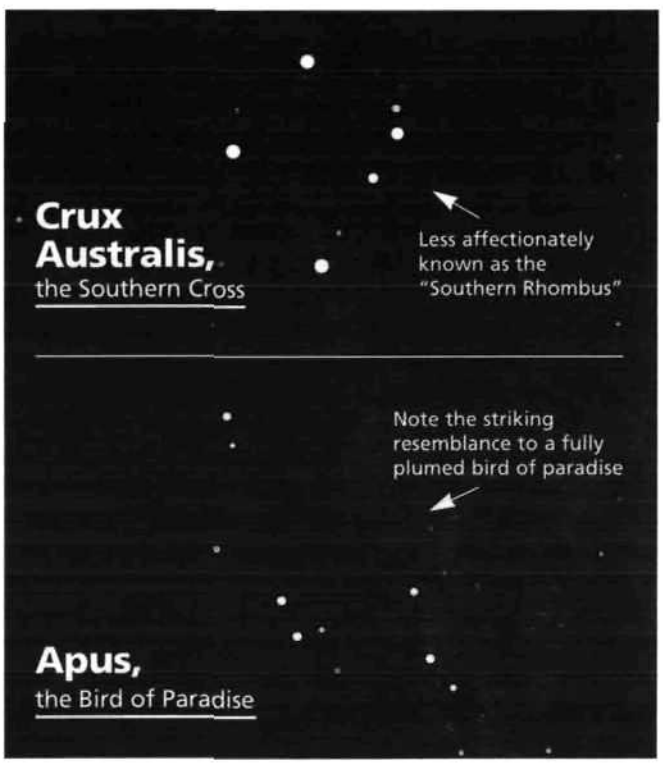
Three-fourths of them unwittingly proclaimed, "The North Star!" Let it be known that the North Star is not even in the celestial top forty. In addition, its reputation puts it at the point in the sky that is directly over Earth's North Pole. In the real sky, however, Polaris is nearly one degree from the north celestial pole—about twice the width of the full moon. I do not wish to upset anybody, but in twelve thousand years, due to the wobbling of Earth's axis, Polaris will be over forty-five degrees from the celestial pole. Perhaps our North Star should be renamed *Somewhere-near-the-pole-aris.* In spite of all this, residents of the northern hemisphere should not complain. Currently, the region of the sky that surrounds the south celestial pole is practically blank. The nearest star with a brightness similar to that of Polaris is over twelve degrees away.

For the record, the brightest star of the nighttime sky is Sirius (Alpha Canis Majoris) in Canis Major, the Big Dog. It is nearly thirty times brighter than the North Star and commonly depicted as the Big Dog's eyeball. Indeed, Sirius is affectionately known as the "Dog Star." Sirius is quite recognizable as it lurks below and to the left of Orion. Sirius is also visible from nearly the entire inhabited Earth during one season or another, but it is best viewed in December and January when it rises at sunset and sets at sunrise. At the end of July, Sirius rises just before the morning sun, as though the sun were walking its dog into the summer sky. This annual celestial ritual thus heralds the onset of the hot and steamy "dog days" of August.



The appearance of Sirius just before sunrise was historically well-timed with the annual rise of the Nile River through Egypt, and thus became a harbinger of a renewed agricultural cycle. So important was (and is) the rising Nile to life in Egypt that the five-thousand-year-old Egyptian calendar uses the appearance of Sirius just before sunrise as the first day of the year.

The nearest star to Earth, as conclusively established by extensive astronomical research, is the Sun. It is often quoted that the nearest star to the Sun is Alpha Centauri, the brightest star in the southern constellation Centaurus and the third brightest star in the night sky. Alpha Centauri is, however, a double star, not a single star, and neither star in the pair is the closest star to the Sun. That privilege goes to the dim star Proxima Centauri, which is near enough to the Alpha Centauri pair to complete an orbiting triple star. All three stars compose the front hoof of the Centaur as he straddles the Southern Cross. At one hundred times dimmer than the detection limit of the naked eye, Proxima Centuri makes a rather demure nearest neighbor.

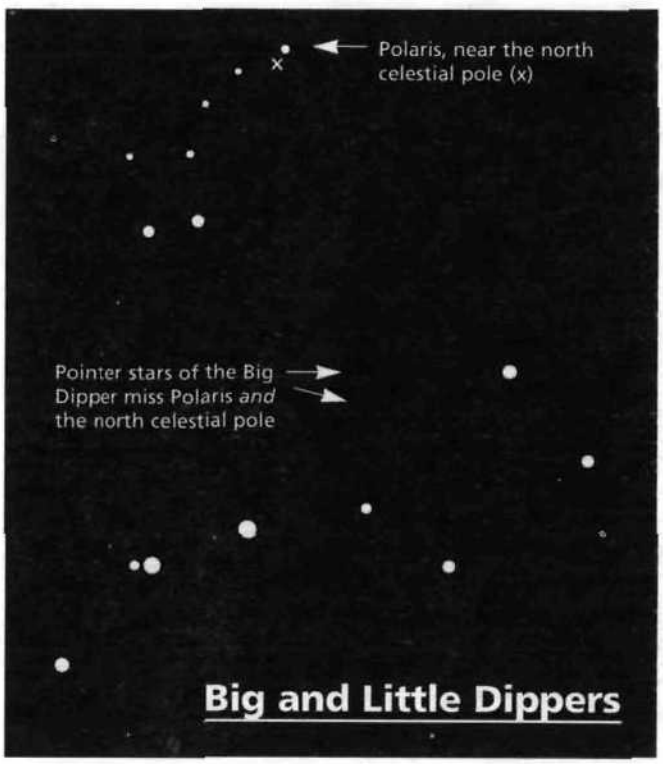
The constellation with the greatest hype is Crux Australis, the Southern Cross. There are songs written about it, and it appears on the national flags of Australia, New Zealand, Western Samoa, and Papua New Guinea. What they do not tell you is that the constellation is small (it is the smallest of all eighty-eight—your fist at arm's length would eclipse it entirely), and its four brightest stars outline the corners of a crooked square, or a kite. In geometric terms it is nearly a "rhombus" (although "Southern Cross" conveys more romance than "Southern Rhombus"). There is not even a star in its middle that could *represent the center of a cross.* The Southern Cross is best used as a signpost to find other, more interesting celestial objects. For example, the Southern Cross is thirty degrees north of the star-starved south celestial pole and ten degrees southwest of the titanic, naked-eye, globular cluster Omega Centauri. The Galactic equator (also known as the "Milky Way") also passes directly through its middle.

Two relatively recent additions to the celestial menagerie are the southern constellations Telescopium and Microscopium, the Telescope and the Microscope. Unlike Triangulum Australis, which is simply boring, each of these two constellations are boring *and* undistinguished. The brightest stars in Telescopium and Microscopium are over one hundred times dimmer than Sirius. These constellations date not from the ancients but from Abbé Nicolas Louis de La Caille of the middle eighteenth century. With decidedly less imagination than the ancients, La Caille identified fourteen new groups of stars from the poorly charted southern celestial sphere. He honorably named them for the principal instruments (hardware) of the arts and sciences. As noble as all this sounds, La Caille had no excuse, and thus is never to be forgiven, for naming two of the least distinguished constellations in the heavens after two of the most important scientific instruments of our times.

A constellation that was simply too big for its neighborhood was the sprawling southern-hemisphere constellation Argo Navis, or Argo the Ship. Its length spanned nearly one-fifth of the entire sky. Mythology holds that this is the same ship made famous by Jason and his fifty Argonauts, who set

sail from Iolchis in Thessaly to Aea in Colchis to search for the Golden Fleece. The disproportionate size of Argo Navis led our friend Abbé Nicolas Louis de La Caille to cut up the constellation into four smaller patterns while preserving the boat theme. Thus were born Carina the Keel, Puppis the Stern, Pyxis the Compass, and Vela the Sail.

Enduring favorites for the three-quarters of the world's population that live in Earth's northern hemisphere are the Big and Little Dippers. They are officially "asterisms," which simply means that they are interesting subsets of otherwise uninteresting constellations. The Big Dipper's seven stars form a convincing kitchen saucepan in the sky: three stars form the slightly curved handle, four stars form the pot. Incidentally, the two stars of the saucepan's front edge are reputed to point toward Polaris, but they miss their target by nearly three degrees. Hanging off Polaris is the Little Dipper. Its handle is curved the other way when compared with the Big Dipper. It looks very much like a caldron ladle with Polaris at the handle's tip.



The Big and Little Dippers are actually parts of the constellations Ursa Major and Ursa Minor, the Big and Little Bears. They are reported to be rather chubby bears (as bears are wont to be) with long, bushy tails that form the handles of the saucepan and ladle. But these long tails are actually part of cosmic tales because tails of terrestrial bears are only nubby stubs.

Keeping with the kitchen theme, we go to an asterism in the constellation Sagittarius. Sagittarius is a centaur-archer who is part man and part horse (the *front* end is the man). In spite of this legendary description, the brightest stars bear a remarkable resemblance to a stove-top tea kettle. It is short and stout—complete with a handle and a spout. This asterism is especially revered in England because the band of light from our Milky Way galaxy appears to pass through the tea kettle's spout. In England, they always take a spot of milk in their tea. In China, however, milk was never a popular beverage. The Chinese know the Milky Way as "Yin-hur," or Silver River. Aside from its kitchen-accessory status, Sagittarius is deservedly famous because it contains the center of the Milky Way galaxy—located about three degrees west of the spout.

The most misidentified asterism in the sky is the Pleiades. This little bunch of seven stars has a vague resemblance to a dipper. Since it is little (your thumb held at arm's distance would cover all visible stars), many people mistakenly call it the Little Dipper. The Pleiades is above and to the right of Orion's missing head. In Greek legend the seven stars of the Pleiades represent the seven daughters of Atlas: Alcyone, Maja, Merope, Taygete, Asterope, Electra, and Celeno. While a simple telescope shows dozens of stars, the naked eye sees only six. Celeno is missing. To reconcile this numerical error the fourth-century Alexandrian-Greek commentator Theon the Younger surmised that Celeno, which is the dimmest of the group, must have been struck by lightning.

The constellations with the greatest irrational following are, of course, the twelve of the zodiac: Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces. One is often led to believe that the zodiacal constellations are prominent in the nighttime sky. But astrologers do not tell you that Aries, Cancer, Virgo, Libra, Capricorn, Aquarius, and Pisces are underwhelming constellations that are barely recognizable as coherent patterns in the nighttime sky. Astrologers do not tell you that the constellations are not the same size so that the Sun does not move across them at equal one-month intervals. Astrologers do not tell you that the correspondence of the zodiac with calendar months is shifted backwards by an entire constellation due to Earth's ongoing precession on its axis. Astrologers do not tell you how much money they make from gullible people.

An amusing addition to the above hijinks is that the Sun passes across fourteen constellations, not twelve. The Sun, after leaving the constellation Scorpius, enters the constellation Ophiuchus. It then stays in Ophiuchus for a longer period of time than Scorpius, the sign that is advertised to precede Sagittarius. The confusing conclusion is that most Scorpios are actually Ophiuchans, and all Scorpios and Ophiuchans are currently Libras. The fourteenth constellation in the set is Cetus. The Sun passes through Cetus briefly as it ambles through Pisces, but you are not normally informed of this in the horoscope pages.

The fact remains: all you ever see in a clear night sky is a few thousand dots of light. If you want to see a real menagerie, and you cannot hallucinate like the ancients, then visit your nearest zoo. You will see real (tailless) bears, real (wingless) horses, real scorpions, and no centaurs. These animals will look exactly as nature intended. And the zookeeper will not tell you about your financial life, home life, or love life. □

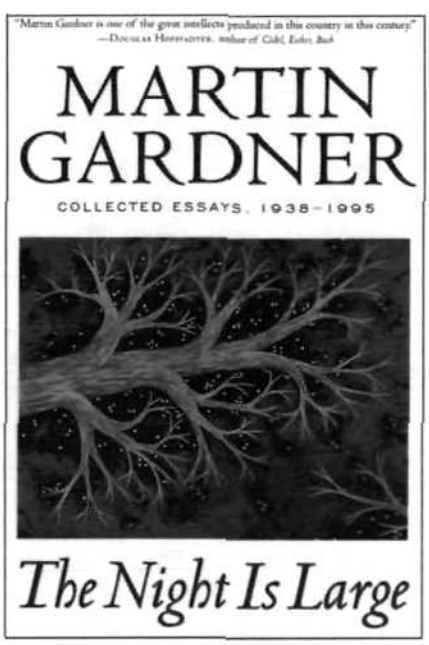
A Mansion of a Book from a Sparkling Intellect

MICHAEL DIRDA

The Night Is Large: Collected Essays, 1938-1995. By Martin Gardner. St. Martin's, New York, 1996. ISBN 0-312-14380-x. 672 pp. Hardcover, $29.95.

If Edmund Wilson was, as they say, the principal American man of letters in our time, then Martin Gardner must be our leading man of numbers. Best known for his long-running and much admired "Mathematical Games" column in *Scientific American,* Gardner is also the author of several important works of science popularization, chiefly *Logic Machines and Diagrams, Relativity for the Million,* and the magisterial *Ambidextrous Universe,* this last an introduction to symmetry and asymmetry that poet W. H. Auden once named as his favorite book of the year.

But, to his many fans, Martin Gardner is considerably more than a guy who knows his way around an algorithm. He is almost certainly the most eminent debunker of pseudoscience since World War II, having exposed the fraudulent, the gullible (reputable scientists taken in by the conjuring tricks of supposed clairvoyants and ESP adepts), and the true believers (in UFOs, Atlantis, New Age religions). Few books are as diverting or damning as Gardner's classic *Fads and Fallacies in the Name of Science* (or its sequels, starting with *Science: Good, Bad and Bogus*). With patient logic, faultless research, and the calm inexorability of a Greek fury on the scent, Gardner pursues those who victimize the weak-minded, sick and misguided. Who else, now past 80 and full or honors, would take the time to write an entire book about the Urantia cult and its followers?



In truth, Martin Gardner seems positively alphanumeric in the range of his expertise and enthusiasms. Consider the invaluable *Annotated Alice* and *More Annotated Alice,* his charming science fiction story about topology ("No-Sided Professor"), introductions to G. K. Chesterton's novels and stories, books about magic, two superb poetry anthologies (*Best Remembered Poems* and *Famous Poems of Bygone Days*), several appreciations of L. Frank Baum's Oz books, substantial essays on philosophical issues (proofs of God, pragmatism, modern Thomism), reflections on Penrose tiles and superstrings, a religious *Bildungsroman* called *The Flight of Peter Fromm,* even an edition of "Casey at the Bat"—all these are further aspects of this myriad-minded, multi-talented man. Not least, Gardner repeatedly shows himself to be without pretense, forthright, and fond of jokes: Using a pseudonym, he once reviewed his own *Whys of a Philosophical Scrivener*—negatively. And in the *New York Review of Books,* no less.

That last piece is included in *The Night Is Large,* a representative sampling of this mathematical magpie's essays and work since *1938(!).* It's a superb volume, a mansion of a book in which one can live happily for a month or visit for a quarter-hour, a modern-day equivalent to one of those catchall classics like Montaigne's essays or Burton's *Anatomy of Melancholy.* Want to know about puzzles in *Ulysses*? The flaws in the Laffer

curve? "Quantum Weirdness"? The mystery of free will? Fractal music? The nature of induction? The Wandering Jew? The Wizard of Oz? Wilhelm Reich and the Orgone? Time travel? Physicist Richard Feynman? The significance of nothing? The irrelevance of everything? These, and dozens of other fascinating matters, are all addressed in these articles and reviews, prefaced with brief, sometimes personal remarks or followed by postscripts updating Gardner's views.

For instance, in the introduction to "How Not to Talk about Mathematics" Gardner writes about the mathematician Morris Kline, who died in 1992. "I had the pleasure of lunching with him some twenty years earlier. We agreed that the 'new math,' then a craze among teachers, had been a disaster, and that the best introduction to calculus, to give a high school student, was Sylvanus Thompson's *Calculus Made Easy.* This amusing book was first published in 1910, and is still in print although no one has troubled to update its terminology." I can hardly be alone in feeling awestruck at the prospect of an amusing guide to calculus (though the autodidact in my soul is already panting for a copy). Here's a bit from the postscript to "Klingon and Other Artificial Languages":

"Mangani is the language spoken by the great apes who raised Tarzan. Several hundred of its words are scattered through Edgard Rice Burroughs's Tarzan novels. I first learned about this from Joel Carlinsky who wrote that as a boy he and his brother actually learned to speak Mangani, and that a full vocabulary is in one of the biographies of Burroughs. A related language spoken by the tailed men in *Tarzan the Terrible* is given in that book's ten-page glossary, along with grammatical rules."

One gathers, through acknowledgments and by such phrases as "I see from my files," that Gardner methodically collects clippings, letters, and notes on the many subjects that interest him. His archives must be hugely impressive, considering the variety of anecdote in *The Night Is Large.* Coleridge, writing about *Lyrical Ballads,* recalled "that he had been told by the publisher that most of the . . . sales had been to sailors who, having heard of 'The Ancient Mariner,' thought it was a naval songbook." Did you know that "in Europe 16, like 69 in the United States, is a symbol of oral sex"? Or that George Eliot twice had her head shaved so that she could undergo phrenological analysis of the bumps on her skull?

Using a pseudonym, he once reviewed his own *Whys of a Philosophical Scrivener*—negatively. And in the *New York Review of Books,* no less.

In the whimsical "Mr. Appollinax Visits New York," Gardner creates a mathematician who, by means of a remarkable function, is able "at one stroke to 1) prove Fermat's last theorem, 2) provide a counterexample . . . to the famous four-color theorem of topology, 3) lay the groundwork for . . . the discovery, three months later, of a 5,693-digit integer—the first of its kind known—that is both perfect and odd." All these are, of course, notable mathematical conundrums. The droll and salacious Mr. Appollinax is quite irresistible; during his New York visit he neatly observes, "I like your Village nonconformists. They're all so much alike." A similar taste for paradox characterizes much of Gardner's prose, as in the sorrowful observation that opens an essay on H. G. Wells: "Today's college students, preoccupied with everything except a liberal education . . ."

Gardner's own education, it becomes clear, is at heart that of a philosopher. He attended the University of Chicago in the '30s, where he edited a campus literary magazine, studied a year of Greek (which he has forgotten), admired Robert M. Hutchins, and majored in philosophy. Several sections of *The Night Is Large* take up issues of modern metaphysics and religion; these pages are written with their author's usual clarity and panache but require keen attentiveness on the part of the reader. Through them we learn that Gardner is a Platonist, an opponent of cultural relativism, a man who believes that the universe is "real" (and not, in some way, the construct of an observer's mind), a thinker who has concluded that it is impossible to find a logical justification for God's existence, and finally a fideist: "What does it mean to say that belief in God works? To fideists it can mean only this—that belief in God is so emotionally rewarding, and the contrary belief so desolate, they cannot not believe. Beneath the *credo quia absurdum* [I believe because it is absurd], as Unamuno said, is the *credo quia consolans.* I believe because it consoles me. The true water of life, says our Spanish brother, is that which assuages our thirst."

Not too surprisingly, *The Night Is Large* will probably only heighten one's own thirst for further refreshment from this sparkling intellect: There are, for instance, 15 volumes of the math puzzles from *Scientific American,* many more first-rate essays (on, for example, the fantasies of Lord Dunsany, G. K. Chesterton and Ray Bradbury), a collection of stories about the ingenious numerologist Dr. Matrix, and, not least, *The Universe in a Handkerchief,* a just-published volume (Copernicus/Springer-Verlag, $19) of "Lewis Carroll's Mathematical Recreations, Games, Puzzles and Word Plays." One can only be grateful that Martin Gardner, at 81, continues to think and work and take unceasing delight in what Chesterton once referred to as "the glory of everything."

Michael Dirda is a writer and editor for the Washington Post's *Book World, where this review originally appeared.*

Final Jeopardy

LLOYD STIRES

Jeopardy in the Courtroom: A Scientific Analysis of Children's Testimony. By Stephen J. Ceci and Maggie Bruck. American Psychological Association, Washington, D.C., 1995. ISBN 1-55798-282-1. 337 pp. Hardcover, $29.95.

As SKEPTICAL INQUIRER readers know, many people have been convicted of the sexual abuse of children largely on the basis of the testimony of the children (Gardner 1993; Loftus 1995). The tide is turning. Several convictions have recently been reversed on appeal, including those of the high-profile Kelly Michaels, Little Rascals, and Amirault cases. Nevertheless, prosecutions continue, as the Wenatchee, Washington, trials demonstrate. *Jeopardy in the Courtroom* is a summary and analysis of psychological research on the credibility of children's testimony. The authors, Stephen J. Ceci and Maggie Bruck, have excellent credentials for this work. They have done many of the studies on which their review is based. They are nonpartisans on the issue of children's testimony, rejecting the extreme positions that children are always or never accurate. Their stated goal is to discover the circumstances that produce true or false testimony, so accuracy can be improved.

The book begins with descriptions of seven cases involving children's testimony, from the Salem witch trials to the Little Rascals day care case in Edenton, North Carolina. The authors return to these cases throughout the book as illustrations of how not to interview children. They then review our inadequate knowledge of the frequency of childhood sexual abuse. There follows a brief minicourse on human memory, the basic point of which is that memory is a *constructive* process that can be influenced by suggestion at the time memories are retrieved. The authors then review the history of research on children's testimony and describe some typical laboratory experiments that investigate its accuracy. The basic procedure is to expose some children (the experimental group) to an unusual experience, such as a medical examination or observing a janitor deface a book, while others (the control group) are not exposed to this event. Later, children from both groups are interviewed using standardized techniques by experimenters who don't know whether the child was in the experimental or control group. The children's testimony is compared to the objective criterion of what actually happened.

The core of the book is seven chapters that describe what we know (and don't know) about interviewing children. The basic organizing principle is *confirmatory bias* (referred to by Ceci and Bruck as "interviewer bias"). Humans have a tendency to search for information that confirms their beliefs, rather than seeking information that might disprove their hypotheses (Snyder 1984). When interviewers start with a hunch that a child was sexually abused, they are likely to engage in a variety of behaviors that ultimately elicit answers that confirm their hunch. Consider this segment in the book from a grand jury hearing in the Kelly Michaels case (p. 121):

> Prosecutor: Did she touch you with a spoon?
> Child: No.
> Prosecutor: No? O.K. Did you like it when she touched you with the spoon?
> Child: No.
> Prosecutor: No? Why not?
> Child: I don't know.
> Prosecutor: You don't know?
> Child: No.
> Prosecutor: What did you say to Kelly when she touched you?
> Child: I don't like that.

By disregarding the child's initial no, the interviewer cues the child as to the desired response and creates confusion in his mind as to what his testimony had been. Once the child agrees that he was touched with the spoon, this misleading statement is incorporated into his memory of the event. The book contains many similar illustrations of suggestive questioning from interview and court transcripts. The confirmatory bias is not deliberate. It feels like a logical interviewing strategy and is characteristic of the behavior of experienced as well as naive interviewers. Researchers do not claim that children are "lying" when they respond to suggestive questioning by making false accusations.

Ceci and Bruck present laboratory and field studies that show, in detail, how confirmatory bias works. Here are some of the main points:

- Interviewers often ask leading questions that suggest a particular answer, such as "Did he touch your privates?" Such questions are more likely to elicit an incriminating response than nonsuggestive questions, such as "What did he do next?"
- When children deny having been molested, interviewers often repeat the question. When this happens, children are likely to conclude that their original denial was the "wrong answer" and switch to an affirmative response.
- Interviewers sometimes negatively stereotype the suspect by referring to the suspect as a bad person or someone who does bad things. This increases the likelihood that the child will make an accusation.
- When interviewers selectively reinforce accusations of abuse with attention and praise while ignoring denials, the child will repeat and expand upon those accusations.
- When children are told that their peers have already reported incidents of abuse by the suspect, they are more likely to accuse the suspect as well.

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• Anatomically correct dolls focus the child's attention directly on what is different about these dolls. In one study (Bruck et al. 1995), when three-year-old children were given a routine physical exam that did not involve genital touching and questioned five minutes later using an anatomically correct doll, *fifty percent of the children falsely reported that the doctor had touched their genitals.*

• Having children imagine they might have been abused and tell a story about it ("guided imagery") may cause them to believe the story they made up.

These interviewing techniques could confuse adults, but they are particularly confusing to children. Research shows that young children are more suggestible than older children.

One irony is that the same manipulations increase the likelihood of accusations regardless of whether the event actually occurred. Suppose, Ceci and Bruck ask, you had a drug that, when given to people with cancer, would cure them but would cause cancer in healthy people. You don't know whether your patients have cancer or not. Do you give them the drug? With children's testimony, almost any procedure that increases the number of true positives increases the number of false positives as well. Should children be questioned aggressively? A pragmatist might say it depends on how strongly you suspect that the child was abused (analogous to the prior probability that the patient has cancer). But given the potential for false accusations, *any* use of these techniques violates the defendant's presumption of innocence.

Ceci and Bruck consider the controversial question of whether it is possible to repress and recover memories of childhood abuse. They carefully define five explanations for memory failure: forgetting, suppression, repression, dissociation, and infantile amnesia. Their review of the literature uncovers no studies of memory failure that cannot be explained by one or more of the alternative explanations. Therefore, there is no solid evidence of recovery of repressed memories. It is of course impossible to disprove the existence of repression.

Can experts or, more important, jurors distinguish between children who are giving accurate accounts of abuse and those who are giving false accounts? I once saw a videotape prepared by Ceci of children describing how they caught their finger in a mousetrap. Their stories were so detailed and emotional that it was easy to see why professionals were unable to tell that the memories were experimentally created.

Ceci and Bruck conclude with suggestions for minimizing future miscarriages of justice. Their most important recommendation is that forensic interviews be videotaped. Reading the interview transcripts, a skeptic can easily detect confirmatory bias. If jurors had access to taped interviews, they could do a better job of evaluating the child's credibility. The knowledge that interviews are routinely taped would be an incentive for interviewers to avoid suggestive questioning. However, it is essential that all interviews be taped from the beginning. Perfunctory videotaping at the conclusion of an interview, after the child has rehearsed his or her story, is worse than no videotape at all (as the mousetrap study shows).

The book is accessible to the intelligent layperson. Readers who make the effort to understand some moderately complex experimental designs will be amply rewarded for their patience. The authors are scrupulously honest in their presentation of research findings. Each conclusion is carefully documented. When no evidence is directly relevant to a particular point, the authors explain that they are speculating and give the reasons for their speculation.

A critic can always claim that sexual abuse is such a traumatic experience for the child that the principles of children's testimony established in this book are not generalizable to real-world investigations of abuse. There is nothing researchers can ethically do to refute this claim. However, some of the manipulations in these studies involve touching the children or having them witness events that probably appear just as bizarre to a child as sexual behavior. To argue that sexual abuse is fundamentally different from these laboratory manipulations is to assume a discontinuity of human experience that is not justified by existing theory or research.

Many of us hope someday to write a book that makes a major contribution to the analysis of an important social problem. *Jeopardy in the Courtroom* is such a book.

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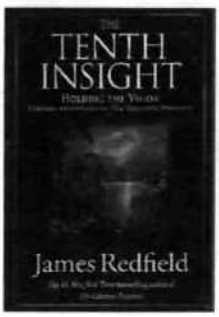

Celestine Redux

JOSEPH P. SZIMHART

The Tenth Insight. By James Redfield. Warner Books, Inc., New York, 1996. ISBN 0-446-51908-1. 236 pp. Hardcover, $19.95.

If you read this book you will discover that the author plans to write a sequel about angels. *The Tenth Insight* is itself a sequel to James Redfield's smash best-seller, *The Celestine Prophecy,* now on top-ten lists for more than a year. In this latest spiritual adventure *Celestine* fans are treated to a continuing revelation of

favorite New Age notions (reincarnation, paranormal powers, spiritual healing, the divine self) through some familiar characters who survived harrowing adventures in South America. The narrator remains nameless again, but clearly "he" represents an alter ego of the author, who shares and promotes the same beliefs. The anonymous "I" teases the reader into identifying more closely with the adventure—not a bad device if your intent is to trigger sympathy for the Insights.

In these further adventures, we learn more about the meaning of the first nine Insights and how the tenth works. The first nine were written on an ancient manuscript secreted since the 1600s in a monastery in Peru by a "Gnostic" order called the Spirituals. The tenth Insight, we discover, cannot be written down because it exists only in the "Afterlife," that heavenly realm in which spirits of saints and angels dwell. It seems that Wil, a character from the first story, has somehow achieved the Afterlife consciousness and helps the narrator to "raise his energy" enough to glimpse it as well.

The story begins in the southern Appalachian territory of, possibly, the Blue Ridge Mountains. Redfield dedicates his book to his "friends" from there. A new character, David Lone Eagle, appears as a stereotypical Native American in the first chapter. David is somehow aware of all ten Insights. He tells the narrator to note any animals that come his way because they will be telling him something on his journey to find his lost soul mate, Charlene. Charlene has been missing from work for a month. All she left was a cryptic note and a crudely sketched map. The remaining guidance to find her comes from the same synchronistic coincidences and applications of Insight energy introduced in *Celestine*.

We soon discover that something mysterious and sinister is about to happen in the wilderness before us. It involves a secret energy experiment led by a power-hungry scientist, Mr. Feyman, who has used Charlene's higher consciousness and tricked her into revealing invisible "vortexes" of energy in the earth that he wants to exploit.

We meet Joel, a hiker who wants to get out of the area. He does not like the feel of the mysterious experiment. He launches into a lecture about the shrinking middle class, the international misuse of religion, our corrupt lawyers, and the doomsday prophets of fundamentalism. We are introduced to the "Fear," an important theme in Insight doctrine. The Fear perception of reality is what Insight practitioners combat by "Holding the Vision"—but we are getting ahead of ourselves. *Celestine* fans are treated to many more didactic digressions, with New Age spins on history, medicine, spirituality, and science. To critics these inane lectures and visions can be amusing if not irritating.

After Joel moves on, the narrator tumbles down a cliff and injures his ankle. Maya Ponder, a black doctor, happens to meet him during a hike. Maya, not surprisingly, is also hooked into the Insights of the Prophecy. As she treats the narrator she shares her "awareness," a combination of standard medical training and alternative, folk, and shamanic beliefs. She teaches the narrator to go into the pain and into all memories and visions associated with it, even to past-life recall. When our protagonist finally does so later in the story, his ankle miraculously heals. Next, Curtis comes into the story as another Insight person who represents the concerned scientist. He knows what the experiment is about and he wants to blow it up.

All Curtis manages to do is blow up a satellite dish that is soon repaired by the experimenters. He reluctantly agrees to the narrator's alternative plan to work with the fated Insight "group" to stop the experiment with psychic energy. Curtis explains that the experimental "device" (presumably a kind of magical psychotronic machine) "has the potential to disrupt [nine] dimensions. It could trigger massive earthquakes or even complete physical disintegration of certain areas" (p. 91). Curtis invokes the quack experiments of Nikola Tesla. Tesla (1856–1943), an eccentric genius who invented the same AC "polyphase" system we use today as well as the induction motor, was responsible for the "Tesla coil," a giant high-voltage generator. The coil was supposed to tap energy fields and transmit electricity without wires through the earth or sky. It never worked and never will (see SKEPTICAL INQUIRER, Summer 1994). Nevertheless, Curtis informs us that "basically it works this way. Imagine the electromagnetic field of the Earth as a giant battery that can provide plenty of electrical energy if you can tie into it in the correct way" (p. 91).

The pseudoscientific Curtis goes on to claim that the infamous "Philadelphia Experiment," a fabulous rumor about a ship that "disappeared" in 1943 from a Philadelphia shipyard, actually happened. The narrator asks, "Do you think they really made the ship disappear and show up again in a new location, in 1943?" And Curtis answers, "Of course they did! There's a lot of secret technology around, and they're smart" (p. 92). (If you are interested in a better explanation of the Philadelphia Experiment, look up the real story behind the rumor in *The Fringes of Reason*, edited by Ted Schultz [Harmony Books, 1989]). This same "energy" that the Fear people are developing is what concerns Curtis. "They could totally ruin this place, make it into a twilight zone, another Bermuda triangle where the laws of physics are in unpredictable flux" (p. 90). He says, "I think they're trying to tie into the energy vortexes in this valley in an attempt to stabilize the process. . . . What they're trying now is insane" (p. 93).

Apparently Feyman, the sinister scientist, who knows that this technology can provide a cheap source of energy if it is allocated in small household units, wants to pre-empt the possibility. Feyman believes that the economy would change

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too quickly if the power is not first centralized. Those in power would lose control. The Insighters believe that no such thing would happen because the emergence of Insight awareness would create a benevolent passage (not without difficulties) toward a Utopian, planetary civilization.

In the chapter called "A History of Awakening" we learn the past-life secret of the narrator and the Celestine Prophecy's origins. Our narrator "remembers" that he was a member of a secret order of Franciscan "Spirituals" in the thirteenth century. The Spirituals (they actually existed) were supported by Pope Celestine V (from 1294–1296) but later "were condemned as Gnostics and excommunicated" (p. 108). In reality, the Spirituals were a radical sect of Franciscans (they called for a literal observance of St. Francis's rules, especially poverty) who had political differences with the next pope, Boniface VIII. They were not Gnostics in the strict sense.

The text suggests many techniques that enable an Insighter to access the Afterlife and knowledge of a personal destiny. The latter comes from Birth Visions, a kind of trance state that helps one to remember one's pure "intent" when entering life this time. The Life Review process is that time directly after death, or during a near-death experience, when a soul has a chance to see his life and prepare for whatever he needs to atone for in the next. The technique for "Holding the Vision" includes sitting in a circle with your soul "group" and focusing on the faces of each member until one can "image," as a group, the higher vision. In the story, the narrator, Maya, Charlene, Curtis, Joel, and David Lone Eagle do this while captives of the sinister experimenters. At a crucial time they manage to "hold" a "hologram" of the vision long enough to disrupt the function of the psychotronic device.

The Insighters receive magical help from "white streaks" or "movements of white light" at significant times. A white light "interferes" to stop a bullet aimed at Maya in one scene. At the end, Wil explains, "They're the angels. . . . They respond to our faith and vision and make miracles. They seem to be a mystery even to those in the Afterlife. . . . I think we are to understand the angels next" (pp. 235-236).

The Tenth Insight is a well-organized complement to *The Celestine Prophecy.* It is slightly better written but the stilted character development remains. The book will sell well, if the five million copies sold of *Celestine* are any indication. The Internet is popping with *Celestine* pages and dialogs all over the world. I found the *Inca Games,* a "magical energy game" or four-hour workshop ($44–$66, 66 maximum players) based on the "energy" of *The Celestine Prophecy.* One young man wrote, "I read the book today and feel it will affect my life in a profound and irreversible way. . . . I have a definite direction in life that will eventually reveal itself to me." Perhaps. Most of the comments I read were from Insight enthusiasts who take the teachings seriously. They truly believe that the powers expressed—the powers of magical healing, soul projection, aura sex, and manipulating love and forgiveness as if they were quantities of divine light—are real. When will they learn? □

Do-It-Yourself Parapsychology

CHRISTOPHER C. FRENCH

Test Your Psychic Powers: Find out the Truth for Yourself. By Susan Blackmore and Adam Hart-Davis. Thorsons, London, 1995. ISBN 1-85538-441-8. 159 pp. Paperback, $9.00.

Purely on the basis of its title, readers of the SKEPTICAL INQUIRER might not feel inclined to pick up this slim volume in their bookstores, mistaking it for yet another New Age self-help manual. This impression would be reinforced by the fact that the book is published by Thorsons, an imprint of HarperCollins Pubs., Inc., that includes among its other titles such gems as *Understanding Astrology, Understanding Tarot, Understanding the* I Ching, and *UFOs: A Manual for the Millennium.* However, the fact that the first author is CSICOP Fellow Susan Blackmore might be enough to arouse interest. In fact, this volume, co-written with science writer Adam Hart-Davis, is anything but another unscientific, wishy-washy psychic self-improvement guide. It is nothing less than a parapsychological do-it-yourself guide, enabling amateur scientists to carry out simple, well-controlled investigations of various paranormal claims.

It contains ten chapters dealing with, respectively, telepathy, crystals, dreams, dowsing, the pendulum, premonitions, psychokinesis, the Ouija board, palmistry, and astrology. The chapters tend to follow a similar format, usually opening with a few interesting anecdotal accounts, followed by a discussion of various theories about how the phenomenon in question might operate (including nonparanormal accounts). Some of the chapters include a brief historical account of scientific research into the phenomenon. The most important part of each chapter, however, is the detailed descriptions of experiments that the reader can try at home. As the title says, "Find out the truth for yourself!" One feature of many of these experiments is that they often explicitly instruct the reader to contrast the results of poorly controlled investigations with well-controlled ones. In investigating dowsing, for example, readers are encouraged to compare the results of a situation in which they know in advance which of six

buckets contains water with one in which they do not already know. If the dowsing rod appears to react strongly to the correct bucket only in the former situation, readers will have learned something very important. They will have demonstrated for themselves that the movement of the dowsing rod is dependent upon the dowser's knowledge of the correct response and is presumably a result of unconscious muscular movements.

The emphasis throughout is upon statistical evaluation of results, and to this end the authors present simple tables of statistical significance levels associated with possible experimental outcomes, presumably based upon the binomial distribution. Unfortunately, Blackmore and Hart-Davis make a common mistake when they are telling their readers how to interpret their findings. For interpreting the results of a dowsing experiment, for example, they say: "To help you work out how significant your findings are, on page 59 there is a simple table of probabilities. . . . The table will tell you the odds against getting that many just by chance. . . . To get a result that professional researchers would call 'significant,' you need to get a score that proves you had a less than 5 percent chance that you were just lucky" (pp. 58–9). In fact, the binomial probability is not the chance that you were just lucky; it is the probability of getting so many hits *if the results were due to chance,* not the probability that your results *were in fact* due to chance. But it would be almost impossible to explain the convoluted and unnatural logic of "null hypothesis significance testing," as it is called, to lay readers in a popular book. Another reason for not being too harsh on the authors for this error is that it is commonly made even in introductory textbooks on statistics!

This is a minor quibble. This book is highly recommended. In particular, its clear and accessible style would make it an ideal gift for the interested teenager. Furthermore, as a lecturer in psychology, I would not hesitate to base psychology practical classes upon the ideas contained in this book. The experiments are likely to be perceived by students as more fun than yet another reaction-time task, and they will also learn a lot about experimental control in the process.

The book does not adopt either an overtly proparanormal or antiparanormal stance, and it is likely to be all the more effective for that. It will hopefully be read by many nonskeptical readers, and some of them may decide to carry out the experiments suggested. Most of them are likely to end up sadder but wiser regarding the possibility that they themselves possess psychic powers. □

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NEW BOOKS

Behind the Crystal Ball: Magic, Science, and the Occult from Antiquity Through the New Age. **Anthony Aveni.** Times Books/Random House, New York. 1996. 406 pp. $28 hardcover. At one time science and the occult happily coexisted, barely distinguishable in method and practice. Here the noted Colgate University professor of astronomy and anthropology strives to provide a balanced account of how and why people in the Western tradition changed the way they think about the real world. Aveni examines magical belief chronologically: The first four sections deal with magic in antiquity, magic from the Dark Ages to the Enlightenment, nineteenth-century occultism (the Fox sisters, "bumpology"), and modern manifestations (psychics versus physics, healing, UFO abductions, life after life, crystals, and geomancy). A fifth section considers magical belief at the millennium.

The Nature of Visual Illusion. **Mark Fineman.** Dover Books, 31 E. 2nd St., Mineola, New York 11501. 1996. 171 pp. $9.95 paper (add $4 if ordering by mail). This is an unabridged republication of a work first published by Oxford University Press in 1981 under the title *The Inquisitive Eye.* A teacher of visual perception who wished to create a book that was intrinsically interesting, scientifically valid, and readable, Fineman explores the psychology and physiology of vision and the extraordinary illusions that confront us (the wagon-wheel effect, Leonardo's Window, Pulfrich's Amazing Pendulum, Poggendrof's Illusion, etc.). More than 100 illustrations and demonstrations are included.

—*Kendrick Frazier*

Barrett, William P. "Unidentified Flying Dollar." *Forbes,* July 15, 1996, 49, 52–53. Subtitled "P. T. Barnum Is Alive and Well in Roswell," this article reports on how Roswell, New Mexico, has turned UFO mystique into a nice business. "Like Hollywood, Roswell is in the fantasy business." Article points out that nothing about this mystery is authentic and quotes people laughing that it's all a hoax; but there's still money to be made.

Barrett, William P. "Now Where Was It Those Aliens Crashed?" *Crosswinds,* August 1996, 14–16, 34. This Albuquerque monthly publishes a major investigative article that pokes still wider holes in the already very leaky Roswell crashed-saucer tale. Points out that there is still not a shred of proven physical evidence of any spaceship that would hold up in court; shows how many of the people involved with the incident have made significant changes to their stories over the years—some with possible financial incentives; and reveals the curious fact that veteran UFO researchers cannot agree on the location of the world's most celebrated UFO incident. Over the years, at least six different southern New Mexico crash sites have been "identified," four in the past few years alone.

Begley, Sharon. "Is There Anything to It? Evidence, Please." *Newsweek,* July 8, 1996, 54–55. As part of a cover-article package titled "Out There," which is keyed to the new interest in aliens and the paranormal triggered by the movie *Independence Day* and the TV series *The X-Files,* this article by *Newsweek*'s science writer is a good report on the lack of evidence to support numerous paranormal claims. Discovery of aliens wouldn't violate any laws of nature, but "claims in other fringe realms, such as telepathy and psychokinesis, are credible only if you ignore a couple or three centuries of established science." Begley briefly outlines the experiments that offer the best evidence of paranormal phenomena and some of the objections to their conclusions.

Bower, Bruce. "Remembrance of Things False." *Science News* 150: 126–127 (August 24, 1996). Excellent report into how what researchers call implanted or illusory memory "has deposited a thick layer of doubt atop any presumptions that recall of past events can be trusted." Recounts numerous experiments showing creation of illusory memories.

Colman, Andrew M., Susan Blackmore, Robert L. Morris, Richard Wiseman, and Christopher C. French. "A Pentalogue on Parapsychology." *The Psychologist,* August 1996, 361–363. Psychologist Colman, ruminating on new book by Susan Blackmore and Adam Hart-Davis (see our review, this issue), raises what he considers an important issue that is too-little discussed: "Why bother carrying out more experiments into obviously non-existent [parapsychological and other paranormal] phenomena?" The subsequently listed authors then respond in turn both to Colman and to the other authors preceding them. Most disagree with his contention and feel there is value in continuing to carry out well-controlled experiments; something useful may be found.

Estling, Ralph. "The Trouble With Philosophers." *New Scientist* 382: 44 (July 6, 1996). Frequent columnist for the SKEPTICAL INQUIRER takes on the idea, recently expressed by a letter writer in the journal *Nature,* that "the fact that we can imagine extrasensory perception and the like is evidence for the fact that they are possible in some sense." Estling easily argues against that point but extends his complaint to the more general point of "philosophers and their intellectual cousins" who write in knowing ways about science until they come up against actual facts.

Kaminer, Wendy. "The Latest Fashion in Irrationality." *The Atlantic Monthly,* July 1996, 103–106. From guardian angels to *The Celestine Prophecy,* from reincarnation to alien abductions, books about spirituality and how to transcend mortality and reach apparent higher planes of existence are now all the rage. "Publishers of popular spirituality books have already died and gone to heaven," says Kaminer. She laments their denigration of science, their insistence on "ubiquity of belief" as evidence of truth, and their "perfectly closed belief systems: the possibility of error is never considered. If you don't see angels, or energy fields emanating from your rhododendron, you simply don't know how to look for them." She even goes into the crossover from New Age beliefs to militias and conspiracy theories, where "science, rationalism, and established religion" are the enemies.

Klass, Tim. "Repressed Memories or Implanted Shadows?" Associated Press, August 1996 (printed in the *Albuquerque Journal,* August 18, 1996, C7, C10). Lengthy, balanced, journalistic account of the wars in courts and on therapists' couches over claims of repressed memories of abuse.

Morrison, Douglas R. O. "Damning Verdict on Cold Fusion." *Nature* 382: 572 (August 15, 1996). Morrison adds further information about an Italian court's rejection of a libel action that Martin Fleischmann and Stanley Pons—the scientists who claimed they had discovered cold fusion—brought against an Italian newspaper, *La Repubblica.* The newspaper had said cold fusion was similar to scientific fraud. Morrison, who had been asked by the newspaper to provide scientific and historical evidence, here says the court did not merely reject the libel claim but also awarded costs against Fleischmann and others. The "skillfully written" court judgment did not give a clear opinion on cold fusion but rather said the evidence is such that it was not unreasonable for a journalist to express opinions similar to those published in *La Repubblica.*

Marin, Rick, and Adam Rogers. "Alien Invasion." *Newsweek,* July 8, 1996, 50–55. Report on how pop culture has been captivated by "all things paranormal, from psychic hot lines to out-of-body experiences." Asks: "How did this far-out stuff get to be so mainstream?" (See also summary of Begley's article on this page.)

"Seeking Common Ground." *Science News* (Letters to Editor) 150: 35, 44 (July 20, 1996). Janet Raloff's June 8 *Science News* article, "When Science and Beliefs Collide" (see our Articles of Note, September/October 1996), was obviously provocative. Here are published sixteen letters covering a whole range of viewpoints about the tension between science and belief.

Wilson, Philip K. "Origins of Science." *National Forum* (Phi Kappa Phi Journal) 76(1): 39–43 (Winter 1996). Paraphrasing the British philosopher Bertrand Russell, Wilson says it is not what scientists believe about natural phenomena that distinguishes them from others, but rather how and why they believe it. He explores when such a system of beliefs began.

—Kendrick Frazier

Beyond the Rational

GLORIA J. LEITNER

When skeptics strive for people to become more rational, more objective, more scientific—creatures of reason rather than creatures of habit or blind emotion—there is both a fundamental truth and an equally fundamental paradox in their goal.

The truth is that too many people are foolishly duped by irrational ideas and leaders of irrational movements.

The paradox is that at the same time too many people are, in a sense, overly rational—they think mechanistically, act automatically, and possess an arid, underused imagination and aesthetic sense. This can result in a shallow sense of self and soul. People seem to need an ongoing deep dose of nonrational or emotional/aesthetic experience to develop creatively, compassionately, and joyfully.*

Cultivating both our rational and nonrational facets is a key to developing fully and healthily. We need to enhance both our skeptical sense and our poetic, aesthetic, and emotional worlds. To deny one or the other is to deny a part of what it means to be human. But to settle for a knee-jerk skepticism or an equally knee-jerk reaction against thinking skeptically is to look at appearances and not at the contexts in which both rationality and nonrationality have their roles. The result is superficial thinking or superficial feeling and perception.

Of course some personalities are inclined more toward the rational than the emotional. But we all have elements of both and need to use both in living. We could not be like Mr. Spock, all logic and intellectual argument, and still cultivate warm relationships or take pleasure in sunsets, music, delicious food, or a good novel.

On the other side of the coin, if we were to live totally mired in our emotions all the time and not exercise reason in deciding how to treat an illness, how to start or end a relationship, or how to make enough money to pay the rent, we would lead disastrous lives. We might become prone to believe destructive ideologies that feed on emotions of paranoia and hate, like white supremacists, or become die-hard defenders of alien abductions and Atlantean telepathy.

The hyper-rational and hyper-nonrational sketches I've outlined above are caricatures, granted. But to many, skeptics as well as nonrationalists can appear absurdly narrow-minded. Skeptics are often perceived (even sometimes by those who sympathize with their aims) as hostile toward any beliefs or activities that value the spiritual side of human nature or the complexity of human experience.

The gap between rationalists and nonrationalists must be bridged. In fact, there is mounting scientific evidence that both physical and mental health absolutely need and rely upon a large emotional, nonrational component.

One excellent source is a recent book by *New York Times* journalist Daniel Goleman, *Emotional Intelligence* (Bantam, 1995). Goleman documents brain research that shows how the seat of rationality, the cerebral cortex, is constantly interacting with the more primitive, emotional part of the brain called the amygdala. To say that the rational cortex is "good" and the amygdala is "bad" is a distortion, for the amygdala plays a key role in making quick judgments that can be lifesaving. On the other hand, the cerebral cortex is needed to balance the sometimes too quick judgments of the amygdala, which, if unchecked, can lead to lashing out in anger or despair rather than thinking through an adverse situation.

Another researcher, UCLA Professor of Psychology Shelley Taylor, focuses on the importance of having an overlay of illusion beyond the mere facts of existence. In *Positive Illusions* (Basic Books, 1989), she talks about the healthy personality as having a mildly exaggerated positive self-image—beyond what "reality" would call for. She thinks that some depressed people are stripped of their positive illusions and may have a more "realistic" picture of the world (e.g., about the inevitability of death) that hobbles their effectiveness and happiness in life. She argues that without an overly upbeat self-image and undue optimism, children would never persevere in learn-

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ing and adults would have a hard time rebounding from adversity.

Beneficial medical effects of "nonrational" treatments—psychological, emotional, and meditative practices—are also discussed in *Mind/Body Medicine* (Consumer Reports Books, 1993). "Meditation, visualization, hypnosis, biofeedback, and numerous relaxation techniques already show promise in helping prevent and treat a variety of illnesses, including coronary heart disease, autoimmune disorders, chronic lung disease, headaches, and gastrointestinal problems, as well as panic attacks, depression, and other psychological disorders," states one of the contributors to the book, Kenneth R. Pelletier, a senior clinical fellow at Stanford University.

In other words, there is mounting scientific evidence that emotions and the nonrational aspects of psyche and self play a crucial, constructive role in the "hard facts" of physiology and disease as well as mental health—a role that cannot be discounted by skeptics wishing that rationality reigned supreme.

But of course an exclusively romantic, nonrational attitude also misses the mark. There is the simplistic "back to nature" view that condemns all technology or social organization as grotesquely distorting or destroying our natural world. There is also the more sophisticated (though no less silly) stance of some academics who refuse to admit that objectivity can exist, whether in science or human behavior, because we're all emotionally and culturally bound. They believe that relativity rules in all realms.

A sensitive, well-rounded view of humans and our life processes would admit to the need for an intelligent, nondogmatic skepticism—as well as a harnessed emotionality and spirituality that does not degenerate into ignorant antirationalism.

Unfortunately, organizations and spokespersons for each point of view tend to exaggerate the other's faults and shortcomings. "You're the devil" has the finger pointing both ways. Both are at fault, and both are to blame, if they oversimplify the "enemy." Both need to come to terms with the partiality of their points of view. Both need to back down from sloganeering and self-righteousness.

Calling it a battle between heart and head is a stark way of putting it, but as a metaphor it throws into clear relief the obvious fact that we have both hearts *and* heads. We not only need them, we should revel in them, enjoy them, and definitely use them both to live comprehensively and successfully.

This is a plea, in other words, for open-sightedness on both sides. Don't let the fight against scientific ignorance become a fight against all religious beliefs or all forms of alternative medicine that use unconventional psychological, spiritual, or emotional approaches. And don't let the fight against excessive rationality become a fight against all use of technology, science, or objectivity. Let us respect both. Let us see the ultimate value of the heart's quest and the ultimate worth of the head's questions. □

*Note: A scientist may have this kind of emotional experience in the midst of an exciting discovery or while pursuing very "rational" experiments, if they engage him or her fully.

Extraterrestrial Unintelligence?

ALTA WALKER

After my shrink changed my diagnosis from SAD (Seasonal Affective Disorder) to MAD (Minimally Abductible Disorder) because I have never even seen a UFO, let alone been abducted by one, I decided to check out the abduction scene. Are they really up there? Are they really down here?

I decided to talk with Dr. Tom Holtz, a paleontologist who teaches at one of the Georges in the D.C. area about the possibility of offworlders—ETs—visiting the Blue Marble.

Tom and I met in a restaurant in suburban Washington, D.C., and I asked him what he thought about abductions.

"First thing I wonder," says Tom, "is how these aliens can be so stupid. If they're smart enough to fly between the stars as easily as we fly from D.C. to Montana, they should be able to figure out our basic anatomy. But during just about every abduction, it takes them hours to figure out that our navels are not our reproductive organs. Why don't they share that information with other ships? Why do they find our bellybuttons so fascinating?"

Maybe they are jealous, maybe they like the lint, maybe they're establishing navel observatories.

"Or could it be that the abductees, not the abductors, have bellybutton fetishes?" Tom asks.

Life on Earth comes in a myriad of forms, shapes, and sizes. About 75 percent of known species are arthropods, tiny invertebrates with segmented bodies and jointed appendages. Humans are not the largest, smallest, or most prolific species. Why would extraterrestrials come in human shape? With 66 percent of Earth being ocean, why not come as whales?

"Probably because whales couldn't write books," Tom says. "The abductors appear to be abstracted, bilaterally symmetrical humanoids, guys with no dis-

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tinguishing features. Even the Klingons and Vulcans in *Star Trek* are more realistic than these guys.

"Speaking as a paleontologist, the default form for vertebrates on Earth is that of a quadruped which has a horizontal backbone and a long tail.

"Most bipeds evolved from running quadrupeds, but humans are the exception. We evolved from tree dwellers; we are the only bipedal creatures that climbed down the tree."

Tom, most abductees claim that after the bellybutton test, aliens want sex. What do you think of that?

"It sounds like an adolescent fantasy," Tom says. "Sex must be on the abductees' minds. If we had sex, there would be a problem of gene incompatibility.

"Species on Earth are defined as collections of individuals who can mate and produce viable offspring. On the rare occasions when interspecies mating occurs, the offspring is sterile. A common example is a horse and a donkey producing a mule. That poor mule is usually sterile. Remember, we don't mate with lions and tigers and bears."

Oh my!

If we can't do terrestrial interspecies reproduction, what about extraterrestrial interspecies reproduction?

"It would be even more difficult. We share 98 percent of our genes with chimpanzees, but we don't reproduce with them. Extraterrestrials could be composed of antimatter or of silicon-based cells. Even if they had a carbon-based DNA system, we would still share zero percent of our genes."

But they look like us, I point out. All the drawings we see show bilateral symmetry, two hands, eyes, and legs. What about that?

"With all the diversity on Earth, I'd be disappointed if real aliens looked like us," Tom says. "Every day, I work with creatures that are more different from us than are the paintings of aliens on the covers of some books. My creatures were real, and they left us with souvenirs—bones and trails."

If the ETs are not interested in having sex with us, why else would they take sperm or human eggs? For caviar?

"No, almost certainly not," says Tom. "They probably would not be capable of digesting terrestrial organic matter. Perhaps they mount them on their walls for trophies."

Recent crime scene analyses show that people never enter or leave a room without collecting or leaving evidence such as dust, hair, dirt, or fibers. Where's the evidence of abduction?

"There isn't any," Tom says.

What role does the human mind, conscious or subconscious, play in all this? I've read that posthypnotic stress disorder, temporal lobe microseizures, sleep paralysis, Munchhausen syndrome, or false memory syndrome may create thoughts of abductions.

"Those are all good possibilities," Tom says. "In fact I would call them probabilities. Some people on Earth would love to have UFOs to rescue us from ourselves. We always try to make sense from what we see. As an example, look up at the next full moon and see who smiles down at you."

For years, I've tried to be abducted, Tom. I even went out in the field in Roswell with a big red arrow pointing to my belly button as I sang "Fly me to the moon," but nothing happened. I was crushed. Were I to be abducted, I would grab the captain's log, a pencil, or anything else I could bring back. What would you do?

"If I were so lucky, I would try to get a tissue sample. Scratch the little bugger. Then, back on Earth, I would run a few tests. We could tell if the tissue was or was not from Earth, and if it was living. *All* terrestrial life forms have nucleic acids. ETs could substitute elements such as silicon or fluorine for carbon or oxygen. I could easily see the substitution in my lab. Alien nucleic acid or its analog would be drastically different from ours.

"I'd also take a camera with UV film. Some life forms on Earth—flowers, for example—have markings in the UV. Bees see them, but we can't. Paintings of all the alleged aliens show big eyes, suggesting that they are nocturnal or they see in the UV. Maybe they have patterns and shapes we can't see. Infrared film might be nice, too. Would we recognize an alien smile?

"I'd also want to bring a tape recorder made to record sound beyond our audio range. We can't hear mice squeak (in the

ultrasonic) or cetaceans yell (in the infrasonic), but those are viable methods of communication. Perhaps the ETs have a language we can't hear."

Tom, we know that at least half the stars in this galaxy are in binary- or multiple-star systems. The only single-star system we know reasonably well has about nine planets. Recent Hubble images suggest our solar system may not be unique in the galaxy. Has life evolved elsewhere?

"I think a better question would be, Could life evolve elsewhere?" Tom says. "Probably. If planetary and stellar processes produce a planet at a decent distance from the primary star, and if the environment was peppered with some of the amino acids we see in space, or if there are acids formed by chemical reactions on the primitive planet, why not? Right now, I can't prove it did, and you can't prove it didn't."

We have no proof of ETs, but we do have proof that humans have active imaginations. The situation reminds me of an old *Pogo* comic strip in which a character said, "Either we are alone in the universe, or we are not. Either way, it's a mighty sobering thought." □

UFO Coverup *from page 31*

land."

The show began by showing several brief home-video segments of bogus "UFOs" while the narrator intoned: "This is not swamp gas. It is not a flock of birds. This is an actual spacecraft from another world, piloted by alien intelligence. . . . Intelligent life from distant galaxies is now attempting to make open contact with the human race. Tonight we will show you the evidence."

The Disney show included the Roswell crashed-saucer case with considerable emphasis on government coverup. At one point, the narrator noted that Jimmy Carter had had a UFO sighting prior to becoming president. The narrator added: "Later, when he assumed the office of president . . . his staff attempted to explore the availability of official investigations into alien contacts."

Then, as the camera rapidly panned a typewritten document, it zoomed in on the words "no jurisdiction," and the narrator said: "As this internal government memo illustrates, there are some security secrets outside the jurisdiction even of the White House." The implication was that even the president did not have access to UFO secrets.

In reality, the memo was an FBI response to a White House inquiry about FBI involvement in investigating UFOs. The memo said that the FBI had "no jurisdiction" to investigate UFO reports and referred the White House to the Air Force. But the camera panned and zoomed so fast no viewer could read the memo.

Near the end of the program the narrator said: "Statistics indicate a greater probability that you will experience extraterrestrial contact in the next five years than the chances you will win a state lottery. But how do you prepare for such an extraordinary event? At Tomorrowland in Disney World, scientists and Disney engineers have brought to life a possible scenario that helps acclimate the public to their inevitable alien encounters."

More recently, Walt Disney Inc. has purchased the ABC television network. I won't be surprised if Disney and ABC use UFOs to attract more viewers.

For the tiny handful of those who produce TV and radio shows dealing with claims of the paranormal who truly want to provide their audience with both sides, the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) is an invaluable resource in providing the names of experienced skeptics. The same is true for print-media reporters. If TV shows on UFOs are 95 percent "loaded" to promote belief, without CSICOP they would be 100 percent loaded. □

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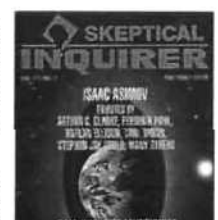

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CD-ROM *from page 22*

creature's existence"; but the encyclopedia nonetheless mentions the discovery of "hundreds of alleged" footprints, visual signs, and photographs, and it quotes a Soviet scientist as saying the creature could be a Neanderthal man. Compton's gives a nine-word definition.

Creationism: *All* four CD-ROM encyclopedias have extensive sections on evolution, but the creationism debate has special characteristics. Grolier raises scientific issues, but then it gives no indication of why the Earth-created-in-six-days hypothesis is flawed or how evolution is misstated by the creationists. Britannica and Encarta bill the controversy as a religious-political debate, with Encarta comparing the Genesis accounts with "other Middle Eastern myths." Compton's simply states competing ideas.

Ghosts: With the exception of Grolier, all the encyclopedias talk about belief in ghosts with nary a hint of skepticism. Britannica gives a pseudoscientific description of hauntings, including "apparitions, the displacement of objects, or the appearance of strange lights"; only when you go to the section on poltergeists is there a suggestion that "in many instances, the activities attributed to poltergeists have been explained as natural phenomena." Encarta defines various types of ghosts. However, Grolier flatly states: "There is no scientifically accepted evidence of the existence of ghosts."

Graphology: The pseudoscientific idea that personality can be assessed by a person's handwriting gets its biggest boost from Encarta, which explains how "responsible graphologists" do their work and says that, although it "has still not been fully accepted as a branch of psychology," results from handwriting analysis "sometimes correspond impressively with experimental evidence." Britannica's entry is much shorter, but just as bad.

Homeopathy: Britannica's only criticism of this highly questionable medical system is that it focuses on the symptoms—but so does a lot of medicine. Grolier says it's "disdained" by most physicians. Encarta says it's "discounted" by most physicians. This suggests that doctors don't want to believe it, not that there's evidence for disbelief. Britannica's and Compton's installments are strikingly similar, as are Encarta's and Grolier's.

Loch Ness Monster: Grolier mentions that many purported photographs of the creature "have turned out to be inconclusive or outright hoaxes." Britannica says nothing about past hoaxes, cites some positive findings, and says the issue is "inconclusive." Encarta says the existence of the monster "has never been proven" and mentions no hoaxes.

Parapsychology, ESP, etc.: Grolier gives a good discussion of pros and cons, including information about allegations of fraud and shoddy experimental design. There's no information about tests of individual psychics. Britannica's discussion of the issue is downright snooty. It mentions inconclusive results, and it reasons, in effect, that because scientists are fighting about it so passionately, it remains unproven and the issue may still be an open one. Encarta's section on psychical research is infuriating. Although it notes how difficult it has been to replicate positive findings, it talks about "reputable psychics" and "persons with apparently outstanding ESP abilities." Compton's article is short and uninformative, saying that "most scientists vigorously dispute the existence of ESP" without explaining why.

UFOs: This is virtually the only pseudoscience topic where the encyclopedias offer good, sound scientific coverage. Ironically, the only product to fall down on the job is Grolier. Its article by David M. Jacobs gives little indication that the weight of the scientific evidence is against an extraterrestrial origin for UFO accounts. □

Judas Priest *from page 38*

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Note

1. This paper is based, in part, on presentations at the annual conference of the Committee for the Scientific Investigation of Claims of the Paranormal, held in Seattle, Wash., June 25, 1994. (Symposium title: Influencing Beliefs in the Courtroom: Rules of Law, Expert Testimony, and Science), and at the Ontario Criminal Lawyers Association annual conference, Toronto, October 27, 1995 (Session title: Deceptive Research: Good Science/Bad Science). □

Maria's Near-Death Experience

In "Maria's Near-Death Experience" (July/August 1996) Hayden Ebbern, Sean Mulligan, and Barry L. Beyerstein claim to have shown "that Maria's supposedly unobtainable knowledge could have been obtained by quite ordinary means . . ." They also point out that their "investigation cannot prove that Maria's spirit did not leave her body and return."

They are too modest. For suppose that Maria had as a result of her Near-Death Experience (NDE) obtained information that she could not have obtained by any normal means. And suppose too that many other people had as a result of either NDEs or Out-of-Body Experiences (OBEs) done the same. Would that have provided us with a good reason for believing that members of a putative kind of immaterial entities call souls had detached themselves from the bodies of these subjects and, while so to speak on detachment, had acquired the relevant items of information for the subjects?

Surely not. Certainly such discoveries would be very significant and—to some of us—very surprising. For if they were to occur, they would have to be interpreted as discoveries that Extrasensory Perception (ESP) occurs in the course of NDEs and OBEs. But, by the principle of Ockham's razor, entities are not to be multiplied unnecessarily. So why, when ESP could more economically be attributed to the flesh and blood subjects themselves, postulate souls which, being supposedly incorporeal and thus lacking organs sensory or otherwise, could themselves obtain information, if at all, only by ESP?

Antony Flew
Reeding, Berks., U.K.

Therapeutic Touch Federal Study

We were pleased to see Carla Selby and Béla Scheiber's critical review of the federally funded study of Therapeutic Touch (TT) for pain reduction (July/August 1996). The authors rightly pointed out several vagaries in the text of the proposal that would likely have been fatal had the study been reviewed at NIH. However, we are concerned with two points made by Selby and Scheiber.

First, they made it clear through printed emphasis that they felt patients' self-reports to be a ridiculous measure of outcome in the treatment of pain (". . . the results are measured by *asking* the patients if they feel better!" p. [16]). Unfortunately, because pain is a private experience, there is essentially no gold standard measure of the pain experience. We can only ask patients to tell us of their pain experience verbally or through analog scales, or by observing the frequency of pain behaviors (e.g., grimacing, requesting medications). These measures might actually be correlated with the subjective pain experience, but they can also be correlated with other nonpain variables, such as disability compensation status (often the case with chronic back pain). Selby and Scheiber might prefer the use of a biomarker for pain, but unfortunately there are none. We are therefore left primarily with self-report measures, some of which have been subjected to vigorous validation studies in their development. They are not perfect, and one can only hope the "measurement error" is not so great as to mask the effects of an experimental treatment.

Second, the authors criticized the use of the mimic to control for placebo effects of TT. This appears to be a valid control condition. The study's authors likely hypothesize that TT will produce greater analgesia than this "attention control" condition. If both TT and the mimic treatment produce equal changes in pain, then either (1) TT is not better than their fabricated imitation treatment, or (2) they have just invented another equally efficacious treatment in their control condition! We look forward to seeing the results of this study in a peer-reviewed research journal, and replication by others.

Dennis R. Wahlgren, M.A.
JoAnne E. Epping-Jordan, Ph.D.
Sheri D. Pruitt, Ph.D.
Back Pain Research Program
Department of Veterans Affairs
Medical Center
San Diego, Calif.

Carla Selby and Béla Scheiber don't say, and perhaps I'm wrong in assuming, that the researchers involved in yet another attempt to validate the efficacy of therapeutic touch are nurses. From personal experience, however, I can attest to nursing's apparent infatuation with alternative health modalities and with therapeutic touch in particular. Selby and Scheiber know well that Colorado's board of nursing, until quite recently, accepted continuing education courses in therapeutic touch as partial fulfillment of its requirements for professional nursing recertification.

This latest therapeutic touch study, though ludicrous, cannot simply be laughed off. It is a symptom of an underlying morbidity eating at the vitals of a would-be professional body. Instead of concentrating on equipping its graduates to cope with the myriad of increasingly complex technical responsibilities arising from rapid advances in medical treatment and technology, four-year nursing departments in major universities vigorously promote "alternative ways of knowing" and evince bristling animosity toward science and toward logic and reason. At least a few professors in graduate schools of nursing are not averse to discussing, in their classroom lectures, New Age ideas (out-of-body experiences, for example) as if to promote and encourage belief in them.

Nursing has squandered an opportunity to gain stature and acceptance as a profession by not attending to its clients. It has abandoned its traditional responsibility as patient advocate and allowed itself to be diverted by specious pseudo-theories, namely those of Martha Rodgers and Jean Watson, and by ill-considered attempts to establish independent, autonomous areas of practice free of medical control. Rather than embracing questionable or spurious alternative therapies that exploit the fears and desperation of the weak and infirm, nursing ought to have directed its energies toward exposing their baseless and fraudulent claims. That did not, and I fear will not, happen. . . .

Sanford M. Russell, RN
Tlaxcala, Mexico

The special report on the Pentagon grant to test Therapeutic Touch raises an important question about scientific method and its practice in a democratic society. Authors Shelby and Scheiber say that public money would be wasted on Therapeutic Touch because it is "highly speculative," but I wonder whether it might not be in the public interest and in the interests of scientists and skeptics to test it anyway.

First, in order for science to discover anything new, it must generate speculative hypotheses, and I do not see what is wrong, in principle, with funding some long shots. That a hypothesis is highly speculative is not sufficient reason for rejecting it. Second, implausible as Therapeutic Touch is, it has such a large following among American taxpayers that testing it might be in the public interest. If the public is paying for it, why not investigate something they want to know? Further, a test of Therapeutic Touch could serve the public by discrediting the treatment, something abstract arguments and authoritative statements have failed to accomplish.

Finally, CSICOP would not be living up to its name if it objected to scientific investigation of claims of the paranormal. I hope the SKEPTICAL INQUIRER will keep its readers informed of how Therapeutic Touch fares in the test.

Sander Gliboff
Baltimore, Md.

Béla Scheiber and Carla Selby respond:

We certainly agree with Sander Gliboff that hypotheses about highly speculative topics nevertheless warrant testing. We have, in the past, and continue to encourage such activity. However, in the case of TT, whose basic tenets have never been demonstrated experimentally, it is incumbent upon those conducting the experiment to ensure that the outcome has not been influenced by predetermined expectations or prejudiced by personal beliefs. Our critique of the UAB burn study failed to make clear the point that this particular study cannot yield anything but a favorable outcome.

Section 4-g (Data Management and Analysis) of the proposal states that for each variable that is measured repeatedly, new variables will be constructed to explore changes over time. Complete blood count, urinalysis, and wound histological data will be gathered daily. These results will be examined, and any marked differences between treatment groups will be analyzed by extension of the previous analysis. Given enough data end points (prospective and nonprospective), it becomes a practical certainty that statistical significance will be found.

We received a copy of a letter, dated 2 December 1994, from a concerned UAB faculty member. This letter was written to him by the Director of the Burn Center. "It has come to my attention you have expressed on numerous occasions concerns about the Therapeutic Touch research grant which is funded in the UAB School of Nursing. This particular grant is for research on my burn patients. It, thus far, has shown amazingly good *(emphasis in the original) results."*

The proposal timeline for the study:

October, November 1994: begin recruitment of subjects . . . enter data as it becomes available.

November 1994 to September 1995: data collection.

After September 1995: data analysis and dissemination.

The study only claims to be a single-blind one. Nevertheless, with nine months of data collection still to be done, "amazingly good" strikes us as premature and overly enthusiastic at best.

The final report has been delivered to the Pentagon by UAB researchers. We have submitted an FOIA request for the report.

Iconoclastic Teaching of Critical Thinking about Science

As a college teacher, I was thoroughly unimpressed with Paul Nickel and Nancy Shelton's manner of teaching the scientific method ("Wait! I've Changed My Mind . . ." [July/August 1996]).

Considering their emphasis on getting the facts right, I was puzzled by the statement that "the Club of Rome predicted a 1980s end of the world . . . . When its doom model failed, the club recovered nicely and explained . . . [that] its work had miraculously alerted the world and converted everyone to needed wise resource use thus avoiding The End." In reality, the Club of Rome's *The Limits to Growth* (by Donella H. Meadows et al., Universe Books, 1972) predicted general collapse as occurring about 2040. Far from backing off, a follow-up study (*Beyond the Limits,* Meadows et al., Chelsea Green, 1992) reiterated the earlier conclusions and noted that many of the predictions in the earlier book were coming true.

"Indeed, if crop disease control in Africa is ever accomplished," Nickel and Shelton claim, "reportedly useable farmland equal to the area of the United States will be added there." This is the typical "if only" scenario of right-wing critics of environmentalism. Arguments that the world can easily support the population of 11 billion predicted by the World Bank (*World Development Report 1984,* Oxford University Press, 1984) for a century from now are based on the assumption not only of increasing resources but a better distribution of both resources and population. The reality is that almost all population growth is taking place in the Third World, and most of that in the poorest countries, many of which are rapidly shifting their resources to the First World.

In 1992, more than 1,600 scientists, including 102 Nobel laureates, signed a "Warning to Humanity" that stated in part: "No more than one or a few decades remain before the chance to avert the threats we now confront will be lost and the prospect for humanity will be immeasurably diminished . . . ." All these scientists may be wrong, but I would rather my students analyzed their ideas with some respect and with open minds rather than be told by me that their evidence should be refuted out of hand.

Ted Lewellen
Professor of Anthropology
University of Richmond
Richmond, Va.

The writer is author of Dependency and Development: An Introduction to the Third World *(Bergin and Garvey, 1995).*

Determining what would be needed to disprove one's favorite model is a worthwhile exercise in critical thinking. Being required to disprove one's model, regardless of its validity, (Nickel and Shelton, "Wait! I've Changed My Mind . . .") is indoctrination.

It is critical that you be aware of your own biases if you teach critical thinking. The authors' biases are evident in their shallow and sensationalist presentation of doomsday strawmen.

For example, the statement "big claims require big proof" appears similar to the concern of skeptics that extraordinary claims of psychics require overwhelming evidence. The difference is that the claims of psychics are extraordinary in that they violate the known laws of science. Many of the "big claims" that bother Nickel and Shelton are extrapolations or engineering models based on standard laws of science.

It is the consequences, not the science, that are extraordinary. Timeliness is important when consequences are extraordinary, while the burden of proof belongs on those who deny them.

Nickel and Shelton take the context in which the atomic apocalypse clock or the Club of Rome model were presented too lightly. The warning "Stop! You're about to walk off a cliff!" is not a failed prediction because the subject of your warning stops and does not fall off the cliff.

Robert Clear and Barbara Judd
Rhamphorynchus Society
Berkeley, Calif.

I was concerned to see Paul Nickel and Nancy Shelton apparently confuse *falsifiable* with *false*. They report that, in order to demonstrate Popper's falsification test, they require their students to "prove their own favorite environmental model to be *wrong* in a documented, 'authoritative,' article." As described, such an exercise sends altogether the wrong message: that *any* warning or other statement issuing from the scientific community may be demonstrated to be false (and presumably, therefore, always ignored.) For a theory to be falsifiable, on the contrary, there need only be *conceivable* evidence that would contradict it—the idea being to ensure that the theory makes some statement about observable reality.

I hope, therefore, that the authors provided a somewhat different explanation for the significance of the exercise than what they described. No doubt the environmental sciences do furnish numerous examples of poorly confirmed theories, and it certainly is a good exercise to be forced to subject one's beliefs to more rigorous criticism than is customary. Let's not throw the philosophical baby out with the bathwater, however.

Paul N. Hilfinger
Computer Sciences Division
University of California at Berkeley
Berkeley, Calif.

Kudos to Paul Nickel for the structural essence of his critical thinking skills and writing course at Michigan State University. However, he attenuates his potential positive impact upon maturing thinkers by pejoratively equating Rachel Carson and Paul Ehrlich with the Indiana Millerites and Branch Davidians.

Carson and Ehrlich were constructive gadflies who sought the very goal that Nickel purports to strive for—a more broadly informed and insightful population, better prepared to question decisions made by authority figures. We are indebted to Carson and Ehrlich for the paradigm shift in perspective that they helped initiate in the 1960s. Their example led us to apply skeptical analysis (Nickel's FRSNs) to the conclusions of many putative experts, corporate leaders, etc. who in the past would have been left to their own devices by a trusting, ignorant, or indifferent citizenry. Carson and Ehrlich were showing us how to question the conventional wisdom of post-World War II industrial consumerism.

Paul Nickel, the resource consultant, and his clients may be discomforted by the need to engage in multifaceted ecological impact analysis these days compared to the good old days of no-holds-barred exploitation of natural resources. But Mr. Nickel should be pleased, as an advocate of critical thinking, that Rachel Carson and Paul Ehrlich have helped usher in the age of comprehensive environmental impact assessment.

If Paul Nickel desires to disembowel environmental doomsayers, he should seek out better examples of agenda-driven thinking such as that represented by Earth First. It is thanks to the pioneering evaluative efforts of Rachel Carson and Paul Ehrlich that in the 1990s we no longer believe without question that "What's good for General Motors is good for the country."

Lincoln C. Miller
Hillsdale, Mich.

"Wait! I've Changed My Mind . . ." purports to describe how to teach students to think critically. But if the authors are experts on critical thinking, why is their own article filled with the same types of logical fallacies they claim to teach others to avoid? What follows are just a few:

Errors in generalizing: Historically, increased consumption of resources has been accompanied by increased exploration (and hence supply of) resources. This is apparently the justification for the authors' claim that the world's resource supply will "probably be maintained" at a steady level no matter how much we consume. Yet this is a physical impossibility. The fact that past production has risen does not mean that there will always be new areas to explore and that there is an infinite supply of minerals in a finite volume and mass of earth.

False analogy: The article ties together millenarians (those who predict the end of the world in the year 2000, or any year that is a multiple of 1000, based on numerology or religious reasons) and environmental scientists, implying that the basis for environmentalism is no better than the basis for the numerology. . . .

Furthermore, it is a distortion to say that environmentalists are predicting the "end" of the world. Environmentalists predict that if human population continues to grow exponentially and consumption patterns do not change, then at some point in the future many people will die and/or suffer from a much lower quality of life. Few environmentalists waste time trying to calculate whether the "crash" will be so extreme as to eliminate human life on this planet; the consequences of the expected crash are expected to be plenty serious even if many humans survive. . . .

Finally, the article says that we must rely on the scientific method to determine the size of a problem and what to do about it. This sounds good (and generally *is* good), but it is neither possible nor desirable to run controlled experiments on the entire planet. It's appropriate to apply the scientific method to a small quantity of nonliving substance in a test tube; it's reckless to insist that we use the same method of analysis and the same standard of proof when the health and survival of billions of people are at stake. Do the authors really think that we should wait until after "doomsday" before taking any action to prevent it?

Mark Gilkey
Mountain View, Calif.

I'm puzzled. The last letter in CSICOP is "P" for "Paranormal." It isn't "E" for "Environmentalism." So why did you print that smug attack on environmentalism by Paul Nickel and Nancy Shelton?

The connection seems to be as follows: (1) Some paranormalists, such as the millenarians, have predicted world-wide disasters. (2) Some environmentalists have predicted world-wide disasters. (3) Therefore they can all be treated with equal scorn. As Nickel and Shelton put it: "Strange bedfellows indeed, the millenarians and the environmentalists."

We can thank Nickel and Shelton for thus illustrating the sixth and twelfth logical fallacies they listed in their article: false analogy and ad hominem.

Their ad hominem is obvious. In the same vein, they go on to lump "Cornell ecologists" in the same category as "Branch Davidians."

Their false analogy is a little subtler: after all, what's wrong with comparing the Ehrlichs' warning of catastrophe from overpopulation with the millenarians' warning of catastrophe from God? For one thing, the millenarians rely on supernatural revelation as the basis for their predictions, while the environmentalists rely on science. I would have thought that difference mattered to SKEPTICAL INQUIRER. . . .

Barbee B. Lyon
Portland, Ore.

Paul Nickel responds:

I thank SKEPTICAL INQUIRER *readers who thoroughly questioned my unusual teaching model. I am instructed by their contentious models and excellent points that tested my model, and, my oh my, how they stung!*

My points, adapting SKEPTICAL INQUIRER*'s critical thinking tests to use in environmental and natural resource studies, are:*

1. We see the world in highly simplified fashion through "models." New models (environmental) are largely unquestioned, and previous models ("What's good for GM . . . "), long discredited, are as good as beating a dead horse for teaching students the stinging questions and tests of science process.

2. FRSNs are useful, specific questions and tests students can use to demonstrate skepticism and disclaim glib, glittering cynicism. "Your skeptical assignments made me want to read a lot more than just one article," said one student. Students learn more from disproving a beloved model than from trudge, trudge, trudge teaching methods.

3. Making students question and test experts and teachers, and having them define and disprove unquestioned "models" systematically, makes them learn and apply science-process tests and questions, and forces them to look for contradictions and alternative explanations. This becomes habitual, ideally producing a cultivated mind.

4. I would argue that The Social Costs of Private Enterprise *signaled the demise of the old model. Did not Carson demonstrate in* Silent Spring *that unquestioned models need testing? Should her generally accepted model be tested now? Was DDT's ban an important* scientific *decision, or was Ruckleshouse's courageous and exemplary* political *decision demonstrating that elected government makes important and necessary decisions more important? Are all returns in on pesticides, chemicals, and pollution, or has the standard become: "We must burn the witches before they destroy the crops and hogs"? Are one or two scientifically deviant toxicologists and epidemiologists right to grumble, "In 50 years probably we'll see today as chemophobia"?*

5. Readers' letters were 100 percent critical of my teaching model. Have writers unquestioningly accepted and uncritically halted tests of the new paradigm? Is this "the end of science process" as we know and love it? Do the letters prove the overwhelming power of current, unquestioned models? Thank you for being much gentler than my students as they disprove my straw people and red herrings.

6. Several readers alerted me to fallacies I probably committed and possible misstatements of fact. Useful tests of course abound—those of the Institute for Propaganda Analysis, others in Professor Seylor's book, and in Historical Fallacies. *I acquired* Confirmatory Bias *at CSICOP's anniversary conference and I plan to commit to it wholesale this fall and, as usual, reward handsomely students who catch me.*

7. The difference between "disproving one's model" as a general teaching approach and specifically proving something false, as distinguished from falsification, is an important distinction and tough to teach. My blowzy generality normally distinguishes null and alternative hypotheses. . . .

8. Two writers suggest students are indoctrinated by prodding and reluctantly choosing to prove their theory wrong instead of right. I'd argue that students come into class already indoctrinated. Students already know what to think because we teach them that, but my model attempts to open minds and to de-program *or* dis-indoctrinate. *I've been proved wrong before and I freely admit it. Is that how useful teachers become free to teach students to question? By admitting ignorance? Perhaps* SKEPTICAL INQUIRER *questioners could attack their own models with FRSNs as a mind-cleansing task?*

9. Do conventionally received wisdom and currently accepted models deserve "respect"? My goal is to teach students thoughtful and reflective questioning and testing, and to warn them of the dangers our egos, stereotypes, and prejudices pose; including the possibility that accepted authority and we ourselves could be wrong. I'd argue for courteous and respectful questioning but not for respect of models. . . . Nobel Prize-winners are admirable and probably right most of the time, but are they always speaking within competence, or are they sometimes pronouncing and prescribing outside it? Youth should be taught to suspect. Science's "bright, blunt, bastards," should question, test, and destroy present knowledge, always hoping to produce the one-experiment-too-many that unexpectedly disproves a lifework by adding the last card that collapses the entire structure.

10. I will show penitence to SKEPTICAL INQUIRER*'s letter writers this fall by attaching, as is my practice, all critical letters to an article to show students how testing really works and how much it smarts if you do it right. If you want to test received wisdom that is universally believed, you have to stand the gaff. I'll assign students to test, assay, and pronounce if Club of Rome's claims are right or wrong . . . so far.*

I learned a lot writing the article and from readers' letters: the awesome power of unquestioned models and righteous belief is overwhelming; we don't even suspect how much we do not know, myself included; we teach students what to think instead of how to properly question; we need to teach students how to use FRSNs and think in dispassionate and unprejudiced ways by making use of science process in the admittedly narrow, limited, and specific models we can appropriately test.

Chinese Medicine

I was pleased to see the article "Traditional Medicine and Pseudoscience in China"

(Part 1, July/August 1996).

There is one small, self-promotional correction I would like to make though.

The article credits me with having authored one piece on Traditional Chinese Medicine, when in fact the article included quotes from both of my articles on the subject. The uncredited article was "Trying to Understand Traditional Medicine" in SKEPTICAL INQUIRER, vol. 18, no. 2, Winter 1994, pp. 207–208. The quote on page 20 of the article comes from that.

Thanks. Perhaps those interested in the subject can consult it as well for further reading. Someday, I hope to write a book on such things, but am still seeking an interested publisher.

Peter Huston
Schenectady, N.Y.

Science and Metaphysics

Gary McGath (Letters, July/August 1996) sees the statement "The metaphysicist has no laboratory" as implying a conflict between science and metaphysics. I see no such conflict, but I'll let Carl Sagan address that problem. McGath states that this opposition of metaphysics to science is fueled by some of the "bizarre metaphysical theories philosophers have proposed." Even after reading and trying to digest all of McGath's letter, I can't decide whether he means to lump together quantum cosmology, certainly a bizarre metaphysical theory even to its proponents, though acceptably bizarre to many people, with say Madam Blavatsky's Theosophical metaphysics. Einstein's general theory of relativity, the progenitor of the big bang cosmology, certainly has bizarre (counter-intuitive) implications. No, bizarreness is not a criterion of rejection by scientists.

As for the universe being the laboratory of the metaphysicist, McGath wants to redefine the meaning of "laboratory." If we grant such a redefinition then the ancient Greeks had the same laboratory. Does that mean we must accept Aristotle's theory of four elements as equally valid as Newton's theory of motion, or Franklin's, Gilbert's, or Maxwell's theories of electricity and magnetism, or the heliocentric theory of Copernicus?

A scientific laboratory is more than just a place to think. There are devices—telescopes, microscopes, clocks, rulers, an astrolabe, etc.—in a laboratory. A blackboard and chalk, a pencil and paper are not scientific instruments; they can and are used to produce garbage as well as wisdom. The scientific metaphysicist, while he has no laboratory of his own, utilizes the output of many scientific laboratories to produce theories by which the results of the experimental scientist may be extrapolated to other values of significant parameters. When that scientific metaphysicist, a theorist, speculates about parameters not under control in the laboratory, he or she enters the realm of philosophical metaphysics.

McGath claims that science would collapse in the absence of a theory of reality. If I correctly comprehend what is meant by a "theory of reality," there have been, and are today, many and varied theories. As there has been no lack of these theories through the ages, and most likely never will be, it is not possible to know if in their absence, science would collapse.

Finally, it seems that McGath has not read Sagan's earlier SKEPTICAL INQUIRER article (January/February 1995) in which he discusses the problem of too great an openness to all metaphysical theories.

Donald F. Weitzel
Winnetka, Calif.

In your July/August issue (Letters) Gary McGath attempted a defense of the metaphysicist (in response to Carl Sagan's article) and asked in his letter, "Do we have reason to regard the scientific method as valid?" The obvious reason for regarding the scientific method as valid is: It works! Can the same be said of the "method" of the metaphysicist?

McGath also asked, "Is there any cause beyond convention to believe that there is a 'real world'?" The answer is "yes" for realists such as scientists, who work with the real world, but might be "no" for metaphysicists, who, unlike scientists, spend most of their time conjuring up and then massaging the unreal. They have urgent need for the unreal because reality provides them with no justification for doing what they do.

Jim Bullion
Marysville, Wash.

Bear's Starbow

Well, Greg Bear has confused matters some more with his letter on the Starbow (Letters, July/August 1996). At the end of his letter he states:

"Given sufficient velocity, X-ray sources will become visible ahead, and infrared and radio sources behind."

Of course, as one approaches "science fiction velocities" (close to light speed) red shift will bring X-ray sources into visibility *behind* the traveler, and blue shift will make visible infrared and radio sources *ahead.*

Never give amateurs too long a rope.

Greg Bear
Lynnwood, Wash.

More on 'Sightings' as Journalism

Bryan Farha's Forum article "Ten 'Sightings' of Poor Journalism" (May/June 1996) elicited a response from Greg Freeman ("It's Not Journalism," Letters, September/October 1996). Farha responds here to Freeman's letter:

Regardless whether Sightings *is classified as news or entertainment, the producers still bear a responsibility for accurate communication of information unless they inform viewers of the nature of the program.* Sightings *does not. Often television programs will communicate the program's nature with either a disclaimer statement, or we may see "Paid Advertisement" in small print at the bottom of the screen. Viewers will not see* Sightings *identify its nature before the program, during the program, or while showing the credits at the end. The show I wrote about aired during prime-time hours. How does a sometimes unsuspecting viewer know to distinguish this show from one of the "news magazines" such as* Day One *(ABC) or* Dateline *(NBC)? In the absence of proper communication or disclaimer, I believe* Sightings *is bound to sound journalistic standards. Their absence is what makes the program distasteful, not the subject matter itself.*

The letters column is a forum for views on the matters raised in previous issues. Letters should be no more than 250 words. Due to the volume of letters, not all can be published. They should be typed double-spaced. Address: Letters to the Editor, SKEPTICAL INQUIRER, 944 Deer Dr. NE, Albuquerque, NM 87122.

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OHIO. South Shore Skeptics, Page Stephens, PO Box 5083, Cleveland, OH 44101 (216-631-5987). **Association for Rational Thinking** (Cincinnati area), Joseph F. Gastright, Contact, 111 Wallace Ave., Covington, KY 41014 (606-581-7315).

OREGON. Oregonians for Rationality, John Reese, Secretary, 7555 Spring Valley Rd NW, Salem, OR 97304 (503) 364-6676, E-mail: joshr@ncn.com.

PENNSYLVANIA. Paranormal Investigating Committee of Pittsburgh (PICP), Richard Busch, Chairman, 8209 Thompson Run Rd., Pittsburgh, PA 15237 (412-366-4663). **Philadelphia Association for Critical Thinking** (PhACT), Bob Glickman, President, PO Box 21970 Philadelphia, PA 19124 (215-533-4677), Web: http://www.voicenet.com/~eric/phact.

TENNESSEE. Reality Fellowship, Contact: Carl Ledendecker, 2123 Stonybrook Rd., Louisville, TN 37777.

TEXAS. Houston Association for Scientific Thinking (HAST), Darrell Kachilla, P.O. Box 541314, Houston, TX 77254. **North Texas Skeptics,** Virginia Vaughn, President, P.O. Box 111794, Carrollton, TX 75011-1794.

WASHINGTON. The Society for Sensible Explanations, P.O. Box 7121, Seattle, WA 98133-2121. Tad Cook, Secretary. (E-mail: tad@ssc.com).

WISCONSIN. Contact: Roxine McQuitty, MATC-West, 1200 S. 71st St., West Allis, WI 53214 (414-456-5402, Fax: 414-873-4446).

* Associate Members of CSICOP Executive Council

The organizations listed above have aims similar to those of CSICOP but are independent and autonomous. Representatives of these organizations cannot speak on behalf of CSICOP. Please send updates to Barry Karr, P.O. Box 703, Amherst, NY 14226-0703.

THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL

AT THE CENTER FOR INQUIRY (ADJACENT TO THE STATE UNIVERSITY OF NEW YORK AT BUFFALO)

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Martin Bridgstock, lecturer, School of Science, Griffith University, Brisbane, Australia

Richard Busch, magician, Pittsburgh, Pa.

Shawn Carlson, physicist, San Diego, Calif.

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Ronald J. Crowley, professor of physics, California State University, Fullerton

Roger B. Culver, professor of astronomy, Colorado State Univ.

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Michael R. Dennett, writer, investigator, Federal Way, Washington

Sid Deutsch, Visiting Professor of electrical engineering, University of South Florida, Tampa

J. Dommanget, astronomer, Royale Observatory, Brussels, Belgium

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Barbara Eisenstadt, psychologist, educator, clinician, East Greenbush, N.Y.

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Frederic A. Friedel, philosopher, Hamburg, West Germany

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Sylvio Garattini, director, Mario Negri Pharmacology Institute, Milan, Italy

Laurie Godfrey, anthropologist, University of Massachusetts

Gerald Goldin, mathematician, Rutgers University, New Jersey

Donald Goldsmith, astronomer; president, Interstellar Media

Clyde F. Herreid, professor of biology, SUNY, Buffalo

Terence M. Hines, professor of psychology, Pace University, Pleasantville, N.Y.

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Gerald A. Larue, professor of biblical history and archaeology, University of So. California.

Bernard J. Leikind, staff scientist, GA Technologies Inc., San Diego

William M. London, Director of Public Health at the American Council of Science and Health

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CENTER FOR INQUIRY

The Committee for the Scientific Investigation of Claims of the Paranormal

P.O. Box 703, Amherst, NY 14226 • (716) 636-1425

The Committee for the Scientific Investigation of Claims of the Paranormal encourages the critical investigation of paranormal and fringe-science claims from a responsible, scientific point of view and disseminates factual information about the results of such inquiries to the scientific community and the public. It also promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues. To carry out these objectives the Committee:

- Maintains a network of people interested in critically examining paranormal, fringe-science, and other claims, and in contributing to consumer education
- Prepares bibliographies of published materials that carefully examine such claims
- Encourages research by objective and impartial inquiry in areas where it is needed
- Convenes conferences and meetings
- Publishes articles that examine claims of the paranormal
- Does not reject claims on a priori grounds, antecedent to inquiry, but examines them objectively and carefully

The Committee is a nonprofit scientific and educational organization.
The SKEPTICAL INQUIRER is its official journal.

Skeptical Inquirer

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