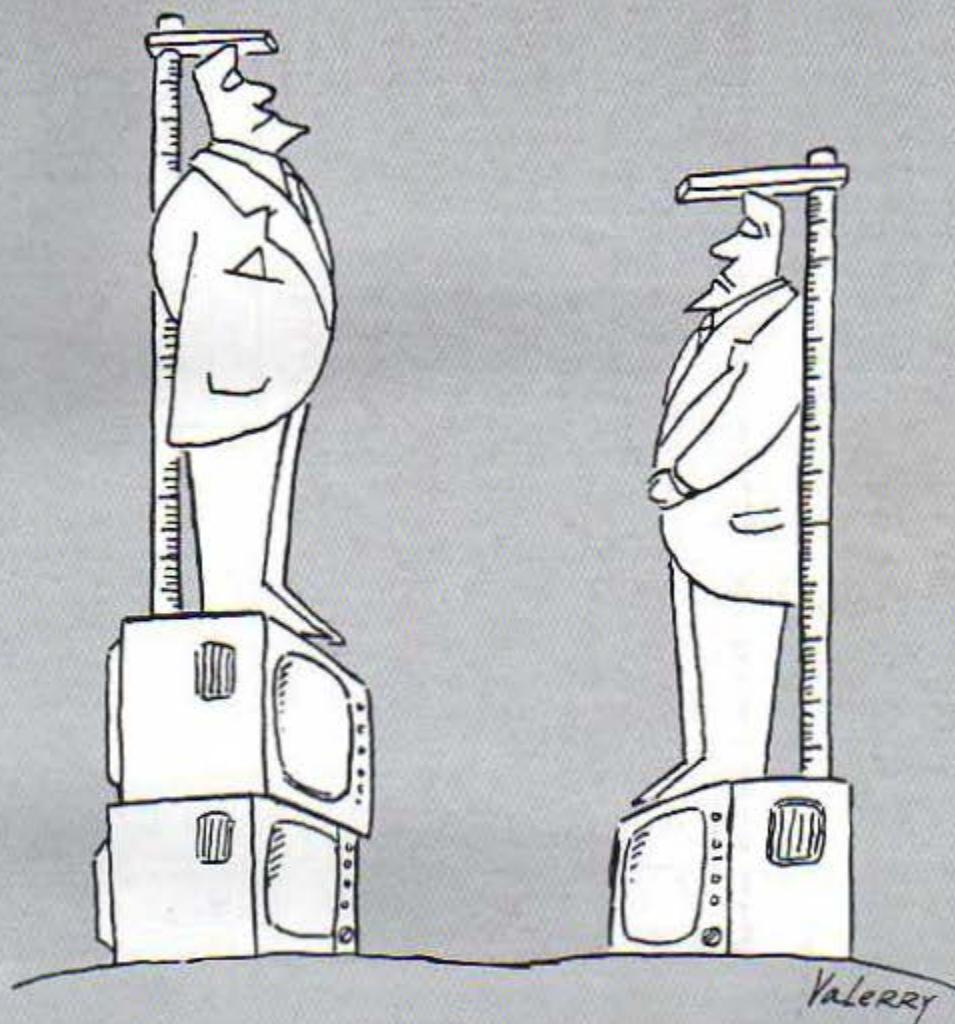


Fighting Nuclear Waste Dumps • An Experiment in Health Care

# SCIENCE FOR THE PEOPLE

Vol. 18 No. 4

\$2.50



## SCIENCE AND JOURNALISM

Measuring Bias in Science Reporting

AAAS in 1986  
COUNTING  
TECHNOLOGY'S  
COSTS

## COVERING CONTROVERSY

Quoting from Stephen Jay Gould's address at the Science and Journalism conference hosted by Science for the People in April, "Errors leave historical tracks." Both science and journalism have to respond to their own—and each other's—miscalculations and misinformation, since each leave a record of their work. Scientists have accused journalists of biased, sensational, and inaccurate reporting. Journalists complain that scientists are inaccessible, elitist, and sometimes biased in their research.

At the conference, scientists seemed to outnumber journalists at the podium, but most of the conference participants came from the media, many with science backgrounds. In question-and-answer sessions and lunchtime discussions, they talked about mutual problems and professional constraints. The atmosphere of critical analysis of both research and reporting was refreshing. Instead of merely defending their own turf, participants and panelists offered suggestions and sympathy for the conflicting and competitive interests of both professions.

Journalists must meet tight deadlines, simplify their stories so that they attract and are understood by nonscientists, and turn complex research into dynamic headlines and compelling news before it reaches a competing publication. To avoid unfavorable or inaccurate coverage, scientists often protect their research, refuse to publish results in the popular press, and use the media for public relations—to promote their work uncritically. Excerpts from the Science and Journalism conference may give readers a taste of their conversations and controversies.

In this issue, Science for the People also takes a look at some of its own controversies. Early in its history, SftP made a notorious mark on the scientific community by confronting the policies and ideologies of its established elite at the American Academy for the Advancement of Science's annual meeting. For seven years, SftP leafletted, organized, protested, and offered alternative workshops and discussions at AAAS meetings. In 1970, the organization received national media attention for presenting Edward Teller, "Father of the H-Bomb," with the Second Annual Dr. Strangelove Award for practicing "science in the service of warmakers." By 1976, SftP was offering workshops as part of the AAAS meeting's official program.

Today, many members of the AAAS are confronting the social and political questions of science and technology, especially in the aftermath of recent technological "accidents" at Chernobyl and Bhopal. But SftP no longer has an organized presence at these meetings to join in the discussion. Seth Shulman's report examines the changes in AAAS and suggests questions for progressive scientists to raise. It's the beginning of a discussion that we encourage readers to join in.

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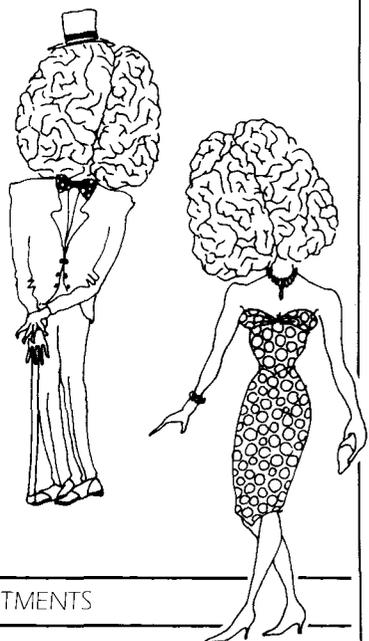
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## Radiation Linked to Communism and Mental Retardation?

Dear SftP:

I thought this might be an interesting post-Chernobyl tidbit for you to print:

From Bernard Berelson (Behavioral Sciences Program, The Ford Foundation). Memorandum to the Members of the Mental Health Advisory Group. November 27, 1956.

I knew all of you would be interested in the following quotation from "Counterattack: the Newsletter of Facts to Combat Communism."

"Dr. Pauling's latest contribution, the Communist *Daily Worker* reports, is the statement that some residents of Nevada already have received enough radiation from atomic tests to—'decrease their life expectancy by three months.'

"Besides his microscopically precise measurement of atomized life expectancy, Dr. Pauling added his belief that scientists would soon show 'a correlation between mental disease and radiation.' In that last connection it is interesting to recall that, just two months ago, Dr. Pauling was named head of a \$450,000 Ford Foundation study of chemical factors possibly involved in mental retardation! And now, along with his Ford cash, Dr. Pauling is able to rattle atom bombs at his audience.

"Please keep this confidential."

—Bart Meyers  
Brooklyn, New York

## New Definitions for Science and Technology

Dear SftP:

We of Science for the People, I think, sometimes forget our name. I have always understood the name to implicitly include technology: Science (and Technology) for the People. What we sometimes forget is the "for the People" part, and what the real meaning of science and technology ought to be. The reason is that we hook our allegiance to words which we don't define and which thus take on, in that vacuum, some favorable meaning which we are pushed into a corner to defend.

Take the words democracy and socialism. Favorable images of cooperation, freedom, sharing, and equality come to mind. Though there

are many countries in the world which define themselves as such, I would argue that there are none on the planet today which display the qualities alluded to above. Perhaps there is some problem intrinsic to being a nation-state which precludes realization of those conditions.

But the issue is that once an entity is defined in such terms as being socialist or democratic, then those who believe in what these words are supposed to represent are put into the awkward position of defending the actions of that entity. After all, how could the U.S. do wrong—it's a democracy, isn't it? Or how could the Soviet Union do wrong—it's socialist, isn't it? Murder is murder, no matter what the entity that commits it chooses to call itself or is labeled by others. The word, the label, prevents us from truthfully evaluating what is really going on.

The same can be said of the loaded terms science and technology. Calling some process science or calling someone anti-science does not make sense until we have defined what the term science means. If we define science to be the scientific method and experimentation, then what the researchers who work on nuclear weapons do is science. But what if we define science to mean the search for truth to serve human needs? Then what the "scientists" who work on weapons research do, though they perform experiments and use the scientific method, is not science at all. Then what is it? Personally, I would call it what it is: building Auschwitzes and weapons of mass destruction.

But the point is that once such activity is included under the label of science, with all its favorable connotations, it acquires a prestige which puts it in the same category as the search for a malaria vaccine—and it shouldn't be. They both aren't science. Likewise, if reality is an interconnected web of phenomena, people, and things, and if science is the search for understanding reality, then one who shuns reductionistic approaches and embraces holistic ones is not anti-science, but pro-science.

Similarly, until we define the term, calling something technology or someone anti-technology is not correct. If we define technology as any process, technique, or mechanical object, then nuclear power plants, steel mills, and Trident submarines are technologies. Instead, if we define technology as processes, methods, and

objects which serve human needs, then, though steel mills and submarines do indeed work, they are not technologies.

What they are can be debated, but again the point is that once such entities acquire the favorable label of technology, they are in the same category as immunization programs. And of course they should not be, for they are not real technologies. Once the entity is stripped of its favorable name tag, it becomes easy to take it for what it is and to not feel forced to defend it. To be against nuclear power plants is not to be anti-technology, but pro-technology.

Science for the People is in a unique position to do what is called for by all thinking people: to go beyond loaded language and to call the shots as they're seen with respect to the phenomena known as science and technology. Hopefully, we are working for a society where our name will be redundant: where science and technology will be intrinsically for the people.

—Joseph Regna  
Medford, Massachusetts



## Rainbow Science Is Anti-Ecology

Dear SftP:

Pardon the late response, but I just received a copy of your July/August 1985 100th issue at the Socialist Scholars conference, and I would like to respond to what I consider a most disturbing short piece, "Rainbow Science," by Mel King, founder of the Rainbow Coalition, and Samantha George.

The words and attitudes expressed in this piece are not only appallingly anti-nature and anti-ecology, but they also sound more like the old black-and-white science. Permit me to quote, in full context as far as possible, so you can evaluate it yourselves.

The piece opens with a quote by

# Letters

Konstantin Tsiolkovsky: "Earth is the cradle of the mind, but one cannot live in the cradle forever." Had a Reaganite rephrased this to say that the human species can only grow up by leaving its origins behind, we might feel differently. How contradictory this is to the beliefs of many of us who believe that only by returning to an understanding of and respect for Nature, our cradle, can we achieve humanity—towards other people and towards non-human creatures.

King/George then go on to comment, using this aphorism as their jumping off place. They talk about leaving behind genocide, racism, sexism, capitalist and imperialist oppression—well and good—but then say this will mean "an evolutionary leap up and onward to a higher order" (shades of Aryan racism) in which "we love and affirm each other as perfect systems within a perfect system." But I thought that the cradle or natural system was something we eschewed to move higher up.

What hubris and arrogance! To regard ourselves as higher, more perfect beings or species is precisely why we are facing such a global ecological crisis. And who brought us there? Why, science and technology, of course, by promising us that their unfettered activities would bring us all wonderful fruits—ending starvation and poverty, relieving the third world peasants of oppression, etc., etc., ad nauseum.

And, wonder of wonders, the authors immediately follow this latter statement by saying, "High technology should provide an escalator to that higher order" (stressing, of course, the non-lethal side of such technology). Tell me, dear authors, once you turn over your money and political power to such high tech, what remains to insure that the non-lethal prevails?

They add: "Only high tech can liberate us from the cradle." Folks, I've got news for you: they've already done this—liberated us from all responsibility for the rest of Nature, alienated us from our origins, and rationalized the destruction and exploitation of non-human species for human ends. They also claim it is an escalator to that same higher order you aspire to, in case you didn't notice.

"So little seems beyond the grasp of our collective creative human imagination," they state. Carl Sagan, Gerard O'Neill, Buckie Fuller, Paolo

Soleri, Rene Dubos—they and others more distasteful to mention would be proud of your faith in science and technology to bring us to new levels of achievement. By the way, have you noticed what science and technology have *already done in the name of progress and human welfare?* Not to mention genetic technology, space colonies, nuclear fission/fusion, synthetic organic chemicals, acid rain, supersonic transport, dying oceans, extinction of species, extermination of rain forests, and not least of all, extirpation of diverse human cultures, tribes, and communities.

"Science, with its claim to structural knowledge of the universe, can be in the vanguard of our movement forward when it is FOR the people, and of the people..." Fine, return "power to the people" so they can legitimately control and determine the goals of science. But I'm afraid many of us won't agree with King/George's goals, like maintaining humans as the pinnacle of evolution as a "higher order," because this is what put us in the bind to begin with. So unless we agree on principles and goals, *before* you start empowering new people to make decisions, we are simply spinning our wheels at best, and reinforcing the present order at worst.

"No doubt exists that we must struggle to leave the cradle," say the authors. Struggle to leave behind our origins, the lessons, values and laws of Nature, the very reason for our existence? Struggle to maintain our profound alienation from, even distrust of and hate for, the rest of the natural world? Retain Nature as an object, as a material subject of manipulation, as an "other"—in the tradition of *rational science*, that continues to violate Nature's being, and in so doing endangers the entire human species?

If you and your readers are not as appalled as I am at this confused mish-mash of sublimely arrogant humanistic attitudes, then either you didn't read the piece carefully, or you agree with it. I fervently hope it was the former.

—Lorna Salzman  
New York Green Party  
Coordinating Committee

## Keep Long Articles

Dear SftP:

In response to your recent call for comments about the magazine:

Don't drop the longer articles. I have particularly valued the in-depth special issues about genetic technology and high technology. We need the kind of focus which a special issue can bring. I will be sorry if SftP becomes a bits-and-pieces newsletter.

By the way, perhaps all of us are vulnerable to criticism and self-criticism at the moment because things on the outside are so discouraging. SO: Carry on, and cheers!

—David Keppel  
Essex, Connecticut

## Central Dogma's Demise

Dear SftP:

I would like to comment on the significance of a recent discovery about genetic regulation that is pertinent to SftP's concern with the politics of genetic theory. This discovery, by the William Haseltine group at Harvard and published in *Nature* (Feb. 13, 1986, p. 555), is of a protein-to-mRNA feedback loop found in immune cells infected with the HTLV-III virus associated with AIDS.

This transactivator protein effect on messenger RNA (mRNA) demonstrates reverse translation from protein back to nucleic acid, a mechanism the authors surmise to be a general one, perhaps involved in zygote development and cellular response to environmental stimuli and stress. The authors acknowledged the revolutionary implications of their finding (*Boston Globe*, Feb. 12, 1986, p. 5) in locating genetic regulation outside the nucleus. I would carry it one important and logical step further (since protein interacts with the environment) and suggest it points to a conduit between the environment and heredity that demolishes some of genetics' basic precepts.

The Central Dogma of Genetics states as follows: that genetic information may transfer from DNA to RNA to protein *only*, in a unidirectional flow of heritable data that removes heredity from all forces of change and regulation except the random strokes of mutation. First the discovery in 1970 of reverse transcription from RNA back to DNA

CONTINUED ON PAGE 32

## MISCARRIAGES LINKED TO ELECTRIC BLANKETS

Two scientists who are well known for their studies linking power line field exposure to cancer have identified a clustering of spontaneous abortions among electric blanket users from September to June. A study by Nancy Wertheimer and Ed Leeper of the Department of Preventive Medicine and Biometrics at the University of Colorado Medical School shows that miscarriages are more likely to occur to women who sleep under electric blankets than those who don't. The study also indicates slower fetal development among babies born to parents who use electric blankets or waterbeds.

The miscarriage rate was much higher from September to January for electric blanket users, but a similar pattern was not found for nonusers. Fetal growth rates also seem to be affected by electric blanket or waterbed use. Infants conceived in the winter had significantly longer gestation periods and below-median birth weights.

"The results of this study could be attributed to either electromagnetic field exposure or to excessive bed-heating," Nancy Wertheimer stated. "However, our ongoing research suggests that the field exposure is important."

Users of electric blankets and waterbeds are exposed to extremely low frequency electric and magnetic fields. According to a study of human exposures from electric blankets performed for the Electric Power Research Institute in Pittsburgh, worst-case exposures to electric fields occur when a grounded individual is underneath an electric blanket which is turned off but plugged in at 115 volts, generating low frequency electric fields.

—information from *Microwave News*

## ALL THAT MEDICINE AND NO HEALTH

Is it possible to determine if you would be healthier in a capitalist or a socialist country? Two west-coast researchers have tackled this question and come up with a resounding "yes!"

Reporting their findings in the June 1986 issue of the *American Journal of Public Health*, S. Cereseto and H.

Waitzkin looked at how the level of economic development influenced health. They analyzed gross national product per capita and other indices like energy consumption per capita, the type of political-economic system, and the Physical Quality of Life Index (PQLI) in 123 countries, covering 97% of the world's population for which such data is available. The PQLI is a composite index combining infant mortality rate, life expectancy, and literacy rate.

Within both capitalist and socialist categories, countries were divided into low, lower-middle, upper-middle, and high income to facilitate comparison. The authors also examined a third socioeconomic category, recent postrevolutionary countries like Vietnam, Angola, and Nicaragua, to reflect current global situations.

At the same level of economic development, citizens of socialist countries were consistently healthier, scoring better PQLI outcomes, than those in capitalist countries. The authors mention two possible reasons: the high emphasis put on public health and universal access to health care in socialist countries, reflected in national budgets, and the relatively narrow gap between the lowest 20% and the top 5% of the population in socialist countries, as compared to capitalist countries.

To improve health in capitalist countries, it would seem sage for physicians to change their advice from "Take two aspirins and call me in the morning" to "Take two aspirins and work for social change."

—Joseph Regna



## BAAAHH-LY RADIOACTIVE

Fallout from the Chernobyl meltdown came down in heavy rains on Britain in early May, affecting lambs in southwest Cumbria and north Wales. Scientists found high levels of radioactive cesium in the liver and muscles of Cumbrian lamb, but the British government hasn't ordered the slaughtering of contaminated sheep yet. Sheep's milk, which remained untested in Wales, continued to be sold.

Although samples of radioactivity in

lambs' flesh were more than twice the level permitted by the British government, no action was taken in the hope that levels would fall quickly. Waiting more than a month, the radiation levels didn't fall, and sheep in the affected areas may be destroyed by government order.

What will happen if high levels are found in the liver or muscles of other mammals, like us? Will mothers' milk be banned too?

—information from *New Scientist*

## NUCLEAR WHISTLE-BLOWING

**N**ow that Seabrook nuclear plant owners have petitioned to load fuel and begin low-power operation, new organizing tactics are called for to protect nuclear workers and to correct and publicly expose safety problems in Seabrook and at the other nuclear plants in New England. In response to this need, the Employees' Legal Project was formed this spring.

While the American public is becoming increasingly aware of the dangers of nuclear power, it is the workers who construct and operate these plants who are most familiar with design flaws and safety violations. The immediate goal of the Employees' Legal Project is to provide the legal and support mechanisms necessary for workers to feel protected enough to bring safety violations to public attention.

It is against federal law to try to prevent employees in the nuclear industry from reporting safety violations. The purpose of whistle-blowing statutes is to encourage employee participation in insuring that nukes are built and operated safely. But since Karen Silkwood was poisoned with plutonium and killed in a car accident while on her way to a whistle-blowing meeting with the press, many nuclear employees have been afraid of becoming martyrs for sharing what they know.

The Employees' Legal Project works with current and former employees of New England's nuclear power plants who have been threatened or discriminated against for trying to rectify safety problems in construction or operation. These problems include quality control, faulty construction, use of substandard materials, improper design of safety features, and engineering errors.

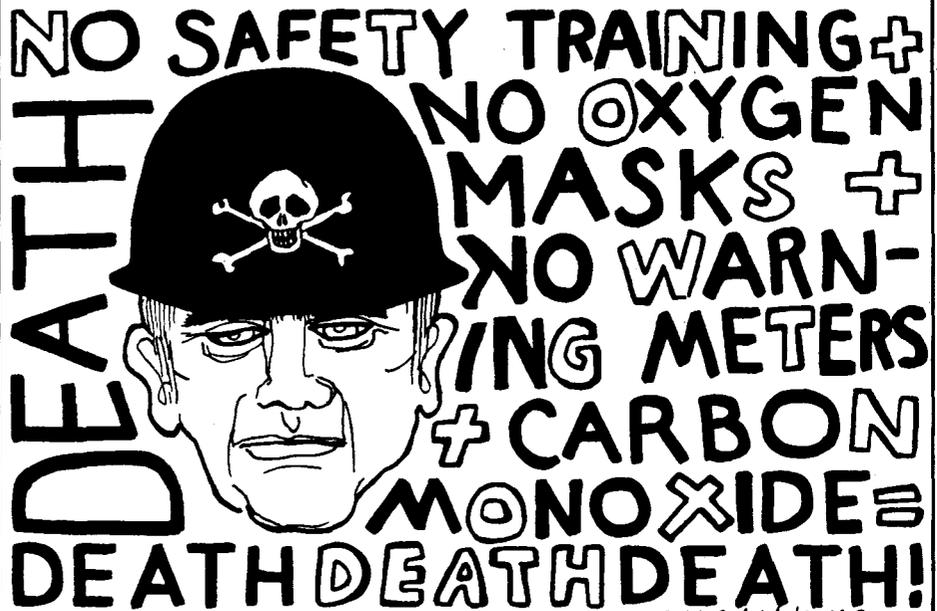
The employee does not need to demonstrate the proof of safety complaints, but they must be made in good faith. The attorneys and staff of the project guarantee the confidentiality of information brought to them, and will provide legal help in taking cases before the Department of Labor or suggesting ways to correct the problems.

Two Massachusetts legislators have publicly supported the project. Nick Costello, senator of the Third Essex District, located inside the Seabrook plant's evacuation zone, said, "As an elected representative for people who live close to the Seabrook nuclear power plant, I urge employees and former employees from the plant to make use of the legal resources available to them

through the Employees' Legal Project. If the nuclear plant is indeed unsafe, it is crucial to the lives and health of the people who live near it that safety problems are corrected before the plant goes on line."

According to Representative Carmen

converted to coal because of workers' whistle-blowing reports. The Midland, Michigan plant was also almost ready to be activated when serious construction flaws were revealed: the plant was sinking into the ground. It's now being converted to gas.



*Cindy Friedrich / L.N.S.*

Buell of the Second Franklin District in western Massachusetts, whose district includes Rowe, home of the oldest commercial nuclear reactor in the U.S., "The Employees' Legal Project is important for people from throughout New England because it applies to operating plants as well as those under construction. There is a need for this project for the workers at the Rowe nuclear plant and for people who work at the nuclear plant owned by Vermont Yankee, located in Vernon, Vermont, just over the Massachusetts border."

The project involves a coordinated effort of more than 50 people doing outreach to locate and help nuclear workers speak out when they know that standards are not being met and laws are being broken by their employers. More than 20 lawyers are volunteering their services for this project.

Attorneys and environmentalists involved in the Employees' Legal Project were trained by the Government Accountability Project, based in Washington, D.C., who have spearheaded whistle-blowing projects across the U.S. They advised workers at the Zimmer, Ohio nuclear plant, which is now being

In the preliminary networking for the Employees' Legal Project, ten workers came forward who know about safety violations at the Seabrook nuclear plant. They have spoken privately with project members about terrible errors in construction at the Seabrook nuke. Given the horror stories these workers tell, it seems possible that a serious nuclear accident could occur at that plant.

For more information or to get involved in this grassroots effort, contact the Employees' Legal Project, P.O. Box 633, Amesbury, MA 01913, telephone 617/388-9620.

—David Gerratt & Leslie Fraser

### SEND US A NOTE

**K**ee a lookout for news that might have missed the mainstream. Send us newsnotes about science and technology news, and we'll extend your subscription for six months for every item we print. Please enclose clippings and sources. Send to Newsnotes, Science for the People, 897 Main St., Cambridge, MA 02139. Newsnotes are compiled and edited by Leslie Fraser.

## TUNA MELTDOWN

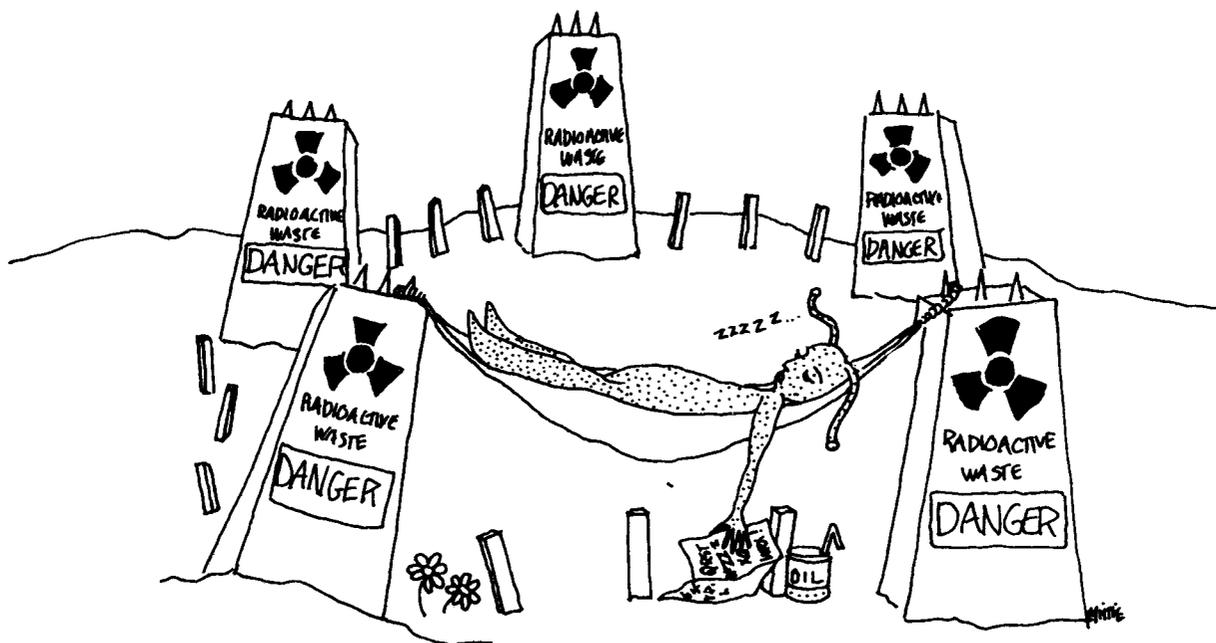
**A**nd now, from the people who brought you the H-bomb, a study on . . . hamburgers? Yes, the Lawrence Livermore Laboratory, the institution which—since Edward Teller sired a thermonuclear device—has done the most to promote death and destruction, is now concerned about your diet. A report on a seven-year study of mutagens in cooked food, conducted by Livermore, was recently published in the laboratory's *Energy and Technology Review*.

The study used the test for mutagens developed by Brian Ames to compare the

mutagenicity of a variety of food cooked in different ways. Nine mutagens, including one that is known to cause cancer in mice, were found in hamburgers. The levels of mutagens in hamburgers increased a hundred-fold in the first ten minutes of cooking, and were further increased by a factor of 10 to 100 when the cooking temperature was raised from 300 to 570 degrees Fahrenheit. The report concluded, "The results [are] clear cut: longer cooking times and higher cooking temperatures produce more mutagens."

When regulators in Washington are not finding it cost effective to ban food additives known to be carcinogenic, such as certain artificial colors, why are researchers at Livermore comparing broiling to barbecuing? We can only guess that their goal is not to protect human health at all, but to increase the amount of unhealthy additives in food by proving that even our favorite foods have their dangers. "Less dangerous than a baked meatloaf," or "safer than fried fish" may be the cries of tomorrow's chemical additive lobbyists.

—Dan Grossman



## MUTANT MONOLITHS

**I**t is the year 11986, and you are exploring a vast wilderness that was called Washington State. It has been ten thousand years since the Great War destroyed civilization and almost extinguished the human race. All records were lost, and knowledge of life before the war is slight. In your wanderings you come across a weathered stone monolith marked in English and five other languages: "DANGER. RADIOACTIVE WASTE. DO NOT DIG HERE DEEPLY."

An unlikely scenario? The Department of Energy (DOE) doesn't think so. DOE, charged with the production of

nuclear warheads, is only second to the Department of Defense in its responsibility for a war that may cause the nuclear annihilation of the human race at any moment. Yet simultaneously, another DOE program, responsible for the disposal of long-lived radioactive waste, is making plans for the next ten thousand years.

Maureen Kaplan of the Analytic Sciences Corporation in Reading, Massachusetts conducted a study for DOE to determine how best to communicate to future generations the danger of actions that might disturb a nuclear waste repository. Her conclusion? A ring of 29

or 30 megalithic monoliths, like the large solid stone monuments at Stonehenge, inscribed with warnings in the six United Nations languages, should surround the site.

Surely the goal of warning future generations of the dangers of nuclear waste is a worthy undertaking. Yet we should also try to eliminate the possibility of a nuclear war which could wipe out the slender threads of human record and knowledge, so that humanity will never forget the whereabouts of its most deadly waste in the first place.

—Dan Grossman

# SCIENCE & JOURNALISM

*On April 19, 1986, Science for the People's Sociobiology*

*Study Group hosted the conference "Science and Journalism:*

*Covering Controversy in Science" at the Harvard School of Public Health.*

*Over 250 participants listened to Stephen Jay Gould's critique of bias in*

*science, Leon Kamin's analysis of studies claiming a genetic basis for crime,*

*and Matthew Meselson's chronology of the search for the cause of Yellow*

*Rain. Workshops and panel discussions focused on sex roles research and the*

*press, interpreting statistics and quantitative data, AIDS research and*

*media coverage, and Star Wars as a scientific and political issue. And a*

*lively lunchtime roundtable discussion asked, "What makes science news?"*

*The following comments from conference speakers capture some of the*

*spirit of investigative curiosity, criticism, and questioning shared by*

*journalists and scientists.*

*The conference was co-sponsored by the  
Boston Globe, Vannevar Bush Fellows Program in  
Science Journalism at MIT, the National Writers Union,  
and Northeastern University's Technical Writing Program.*

# ARE THERE GENES FOR CRIME?

## Steal Now, Pay Later



BY LEON KAMIN

**T**he following comments were excerpted from a longer talk given at the Science and Journalism conference. Using the recently published book *Crime and Human Nature* by Harvard professors James Wilson and Richard Herrnstein as a case study, Leon Kamin addresses problems in data, selective citation of research, and faulty arguments that claim a genetic basis for crime. During his discussion of studies cited in their book, he showed slides containing the data interpreted below.

Richard Herrnstein was also asked to speak at the conference, but declined the invitation. He suggested instead that conference participants read his book.



In *Crime and Human Nature*, the authors write that there is actually evidence that children today are much less capable of delaying gratification—that is a key concept for them—than used to be the case. In the old days, children could delay gratification; nowadays, they can't. And it is that inability to delay gratification that might explain why we have rising crime rates and terror in the streets.

As evidence, they cite a study which compares two samples of juvenile delinquents who had been placed into institutions in the state of Rhode Island. There were 57 studied in 1959 and 50 different delinquents studied in 1974. What this study does, simply, is to ask the kids, "If I were to give you a dollar, what would you do with it?" And the child's

answer is coded by the psychologists who did the study as to whether the child is going to spend it right away or put it away for a rainy day—that is, to delay gratification.

When 57 delinquents were asked in 1959 what they would do with a dollar, 17 were going to save it, whereas by 1974, only 8 out of 50 were going to save it. That may not be a massive trend, and indeed, if you do the traditional test of statistical significance, this is well within the range of sampling errors. We really don't see that anything has happened over

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time here at all. The results are a lot less dramatic if you ask these same children, "What would you do if I were to give you \$100?" Thirty-three out of 57 would save it in 1959, compared to 24 out of 50 in 1974, which is not remotely near a significant difference between the two groups.

And this is based on the rather astonishing assumption that the value of a dollar in 1974 was the same as the value of a dollar in 1959. In fact, I've checked the Consumer Price Index, and the dollar had declined by 41% in value between those two dates. Any serious theory would expect a smaller portion of children to say in 1974 that they would save a dollar.

But they go on from this to speculate about some of the reasons why it might be that children nowadays can't delay gratification. And they offer as a serious speculation that nowadays, due to the advances in medical technology, children who are born prematurely and at low birth weights survive. In the old days, those children used to die off. But now these children are living to adulthood, and when they grow up their brains have been damaged, possibly by the drinking and smoking of their mothers. That's raised as one of the real possibilities. So that as adults, they really can't delay gratification. That's rather a large sweep from not that impressive a bit of data.

They're very serious about the concept of delayed gratification. Wilson and Herrnstein point out, for example, that they themselves had to forego many days at the beach and of playing tennis in order to write something that may or may not be purchased and read several years in the future. Now that's the way Harvard professors behave. Criminals, however, are "more likely than authors and students to assign a very low value to distant rewards." Well that claim itself, I think, doesn't really explain why criminals murder, pillage, and rape rather than just occupy vacant spaces at the beaches and tennis courts left by Harvard professors.

But make no mistake, the criminal is very different from the good citizen. He cannot resist the rewards of an immediately available opportunity, so he snatches a purse if it is at hand. And the type of citizen preferred by Wilson and Herrnstein returns purses to their owners, waits long hours in line at the employment office, and saves his money for a rainy day.

There are other studies whose point is to show that people who are either juvenile delinquents or adults convicted of crimes cannot delay gratification. One study is by Rosenquist and Megargee and cited by Wilson and Herrnstein. In three separate cultures—Anglo, Chicano, and Mexican—

institutionalized delinquents are asked what they would do with various sums of money again, if they were to be given the sum of money by the experimenter. The results were the same across all three cultures. And the comparison is between institutionalized delinquents and ordinary high school students.

What we're told is that the delinquents are much less likely to delay gratification than are ordinary high school students. If you look at the data, that is true—if you ask them what they are going to do with 25 cents. Fully 24% of the control—the ordinary high school students—would save the quarter, they say, compared to

Wilson and Herrnstein point out that they had to forego many days at the beach and of playing tennis in order to write something that may or may not be purchased and read several years in the future.

only 6.7% of the delinquents. That's true of 25 cents and of \$2, but notice that by the time you get to \$20 and \$200, there is simply no significant difference at all between the two groups.

I think that anyone with common sense looking at this data will understand that the delinquents are responding in a much more flexible and realistic way than the high school students. They feel no need to tell some psychologist who comes and plays a silly game with them, "Oh yes, I'd run and deposit a quarter in my savings account just like that." It's only ordinary high school students who play that kind of game according to the rules with experimental psychologists.

You might want to know what the experimenters are saying about this data.

You won't find out from reading Wilson and Herrnstein. But the experimenters say that the problem is that 25 cents and \$2 are realistic sums of money to these kids. When we start talking about \$20 and \$200, that introduced an element of unrealism—that isn't real money. So now the kids are only telling you what they think you want them to say. They're really telling you the truth when you ask them questions about a quarter and \$2. As you can see, there's no way of beating that kind of logic, is there?

This result could easily have been anticipated from the results of another study that is also cited by Wilson and Herrnstein, but again you've got to go to the raw source to find the data. This study is done in New Zealand with adult criminals. A paper-and-pencil test of personality was administered to a reasonably large sample of incarcerated criminals and to a control group of ordinary citizens. Many of these standardized paper-and-pencil tests of personality contain within them something called a lie scale. The lie scale is a harsh title, but it is really a bunch of items which only a saint could truthfully say didn't or did apply to him.

The point is to see whether some people have an exaggerated tendency to paint glowing pictures of themselves and refuse to admit to any human weakness at all. What the authors of this study found out was that, to their astonishment, the incarcerated criminals had much lower scores on the lie scale than ordinary people. Whether this disarming candor about their less admirable traits would also be true when they appeared before parole boards for hearings, psychologists haven't studied yet, but I assume that's on the agenda.

A bit more serious than this kind of "what would you do if" verbal game, there are also a series of studies where psychologists have compared the behavior of institutionalized young children—delinquents—to those of the control group, when the child actually has to make a behavior choice between an immediate small reward and a delayed larger reward. The experimenter says to the child something like, "Thank you for having played these games with me. I promised you a candy bar as a reward, and I'll certainly keep my promise. But I'm running out of candy and I can't give you all candy right now. If you want, I'll give you the small candy now, which is what I promised you. But if you prefer, if you're willing to wait one week, I'll come back a week from now and give you a candy much larger than this one—perhaps five times as large, or five candy bars rather than one."

So now you actually get a behavior

measure. Each child must make the choice between an immediate small reward or a delayed larger reward. And Mischel pointed out years ago in a study done with black children in Jamaica that a higher proportion of institutionalized young juvenile delinquents went for the immediate small reward. That is, they did not delay gratification, compared to noninstitutionalized ordinary school children.

Well, whatever evidence that might suggest, what you're not likely to find out, and what no working journalist will find out from reading the book or from talking to Wilson and Herrnstein, are the following kinds of items. In the first place, it turns out that the proportion of children who say they will opt for the delayed larger reward depends, to a very substantial extent, on the identity of the experimenter. With two different experimenters, not given any explicit instructions but given random samples drawn from the same population of school children, one will consistently elicit a much greater proportion of delayed gratification choices than the other.

We have known for years, in behavioral science, that experimenters influence the behavior of rats running through mazes, let alone children making behavior

understand that there's a lot of scope in this research for unconscious experimenter bias.

It also turns out that there is no general trait for inability to delay gratification. That is, as Mischel has pointed out, it depends upon what kinds of reward are being offered. The same child who will say, "Give me a small candy now, rather than one five times as large a week from now," may say, "OK, if I can watch five TV programs next week, then I will give up the chance to watch one now." In short, there isn't a general trait within an individual child of an inability to delay gratification across all types of rewards. But it is such a general trait that's called for and indeed explicitly declared to exist by the Wilson and Herrnstein book.

Finally, the more quantitative among you might want to know what the reliability of this test is when given to a young child. That is, what is the likelihood that the same child, given the same test on two separate occasions, will make the same choice? It turns out that there is a very large study done by the Educational Testing Service some years back in connection with the Head Start program in which hundreds—I think 450 young children—are asked one year apart to make

from a fundamental conceptual flaw. Wilson and Herrnstein often seem unwilling to distinguish clearly between correlation and causation.

What if it really were the case that delinquents tend toward a particular type of physique? What would follow from the discovery of such a statistical correlation? Well, Wilson and Herrnstein assert that if it can be shown that criminals do not differ from others in bodily constitution, then it would seem plausible to suppose that crime results from a criminal's economic, cultural, social, and political circumstances rather than his constitution. So they set up that false dichotomy to begin with. It is going to be one or the other, and if it can be shown that they don't differ in constitution and genetically, then perhaps we can start thinking that it might be the economic and social circumstances.

With such a simplistic and false dichotomy set up, their next step is to argue that showing a constitutional correlate amounts to counter-evidence against the purely environmental explanation. The task of research thus boils down to a hunt for the external constitutional correlaries: the visible stigmata, if you like, of crime.

And the light at the end of the research tunnel is dazzling. Because, they say, if it turned out that most criminals were, say, red-headed and freckle-faced, we would be on the trail of genetic correlates of crime. Just because red-headedness and freckles have a genetic basis.

Well, as Steve Gould said in his talk this morning, that's a rotten argument. This kind of logic asserts that, should it turn out that people with black skins make up a disproportion of the unemployed, we're on the trail of a genetic correlate for unemployment. Just because black skin has a genetic basis. Well, we are on such a trail, of course.

But a purely experimental explanation attributing black unemployment to racism need not deny that the skin color of blacks is attributable to their genes. Though their genes are correlated with the state of being unemployed, there is no meaningful sense in which the genes of black people cause their unemployment. We can easily imagine a society where skin color would no longer be a genetic correlate of unemployment.

The confusion between the genetic correlates and their causes is plainly illustrated by Herrnstein's earlier observation, that as technology advances, the tendency to be unemployed may run in the genes of a family as certainly as bad teeth do now. The simple fact is that unemployment, like crime, is a social phenomenon. Neither can run in the genes.

Criminals, however, are "more likely than authors or students to assign a very low value to distant rewards." Well that doesn't really explain why criminals murder, pillage, and rape rather than just occupy vacant spaces at the beaches and tennis courts left by Harvard professors.

choices. Something I hope journalists understand is that in the behavioral sciences, when people are working with live human subjects, the biases and theoretical preconceptions of the experimenter cannot help but influence, and often profoundly, the behavior of the subject being studied. And if you have experimenters doing studies upon children who are convinced that a particular type of child can't delay gratification—I'm in no sense impugning the integrity of the experimenter—most scientists would

this same behavioral choice between a small, immediate reward and a delayed larger one. The correlation between the two choices when made one year apart—you are not going to believe this—was literally minus 0.01. That is, there was nothing but an absolute chance relationship between the child's choice today and that same child's choice a year from today.

But the major flaw in *Crime and Human Nature* isn't really in the data. Far more seriously, the book, in common with much of contemporary social science, suffers

# SCIENCE WRITING

## Reporting on the Front Lines

BY JULIE ANN MILLER

I think that we need to look at science journalism as a type of journalism, rather than a subfield of science. I feel really uncomfortable when I hear people talking about science writing having a special purpose beyond that of other parts of the news—beyond informing people about what scientists are doing and why it might be relevant to them.

On the one hand, you have scientists who are proprietary about science journalism, thinking that maybe they will become writers when they retire. On the other hand, you have people who see science writers as wise evaluators of science. That would be very nice, but I write three or four stories a week and there is no way I can do a thesis-style evaluation of everything that I write.

So hopefully, you are just alerting people to what's going on, and getting scientists in touch with each other. But some people are going to misinterpret what you say. I wrote an article about a fairly esoteric genetic work that had some implications for cancer research, and this work happened to be done in yeast. I got a letter from someone saying, "I knew yeast causes cancer. I am never eating bread again." But I don't think that was a reason not to write about it.

I think we have a responsibility to try to point out the different implications of new research, rather than not writing about them. With the topic of PMS, some people interpreted it as another sign that women are all a little bit crazy. Other people interpreted it as finally taking seriously these symptoms that some women have. Up to that point, some doctors thought that women were just complainers, always talking about feeling bad before their periods. Now maybe the medical profession will address PMS more seriously.

It's the same sort of thing with brain differences. Some people will look at brain differences and say, "Well, this proves that men are smarter than women." But if there really are differences in the male and female brain, I want my brain surgeon to know

*Julie Ann Miller is a science writer for Science News, and holds a doctorate in neuroscience.*



about them. So I think these issues can have medical implications, and are worth writing about and bringing up in as responsible a way as possible. You don't want to ignore the topic just because it has certain political implications.

One way to do this when you are talking to people is to ask questions that reveal social bias. I was really struck by one of the articles in the conference materials packet from *Discover* about a disorder in the Dominican Republic, where children

appeared to be girls and then at age 12 suddenly turned out to be boys. This article quotes the researcher as saying that they were able to make this adjustment easily because they had a male brain hidden in a girl's body.

I thought there was more than that, and I looked up an article I had written about this story in 1980, when it first came out. In my article, I quoted the same researcher as saying that the seemingly easy acceptance of the sex change must be viewed in the perspective of the Dominican society, where there is clearly an advantage to being male. The men had all the good things, and the women stayed home. For somebody to find out at age 12 that they're not in the bottom class but in the top class—that was a relatively easy adjustment to make.

There aren't any examples that I know of going the other way. But I think that it would be a lot harder if someone had been raised as a boy to suddenly hear, "Oh no, you have to stay home and cook and sew now." Well, I guess it was just a year later, and the researcher had forgotten or stopped talking about that. Or maybe the science writer hadn't asked that question.

As for scientists, what they can do is to try and keep science writers informed. If there is a particular issue you're really concerned with, you can write to a science reporter and suggest people they can talk to.

Recently, I've been very impressed with Jeremy Rifkin. Whatever you think about his approach to biotechnology, he certainly knows how to put out a press release. And he includes the names and telephone numbers of not only the people who support him, but the people who oppose him. This really guarantees that he will get stories written. Sometimes you get a story, and if the scientist doesn't volunteer information about who might be on the other side, it can take you a week to track someone down. So sometimes the story gets written without having the other side in it at all.

The editors play a role in the sort of bias that gets into science writing. That causes writers to overblow stories, to make them longer, and to try to get better placement. Editors also have a role in the assignment of articles, and they tend to assign somebody

to a story who supports their own political view. And if someone else on the staff wants to write about a certain topic, they will subtly or overtly discourage them.

Also, the people writing about a certain field tend to be the ones impressed with the work going on in that area. I have often had nightmares about being a psychology

writer on our staff, because I have a lot of problems with a lot of the work we write about. If it were my job to choose the stories, there wouldn't be very many. But this also makes for a certain bias in reporting.

It's nice to think ideally what we would do to cover a story. But you are under the

pressure of deadlines and changing topics all the time. You also want to say to scientists, "Every time you do a research project, you should do this, this, and this." But I really have doubts that a lot of scientists would come to a conference like this to hear journalists tell them what they are doing wrong in their research. 

# BIOLOGY IS NOT DESTINY

## A Transactional Model for Gender Differences in Behavior

BY ANKE A. EHRHARDT

**M**y field is the study of gender differences in human behavior. And over the last 20 years or so, I have attempted to identify both biological and social environmental factors which may contribute to gender differences of behavior of boys and girls, and of men and women. My area of research has gone through some dramatic changes, from attributing major or exclusive importance to social factors, and more recently to becoming very focused on biological factors.

Perusing the material that was distributed for this conference, I was struck by how much our thinking is still cored in too-simple models. We continue to strive for the one crucial determinant of behavior which would give us the ultimate truth. I would suggest that we will fail and not make progress in our understanding, unless we apply more complex thinking that includes a multifactorial approach.

So far, the model most often applied is the main effect model, which postulates that one factor determines, or predominantly influences, a particular behavioral outcome. That model has the advantage of being simple, practical for the researcher,

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convincing for the journalist, and conclusive. The problem with the main effect model is that many cases do not fit such a one-factor model. Therefore, we are particularly vulnerable to going from one new discovery to the next in the hope of finding a better explanation of the behavior under study.

I would like to make a plea for an interactional, or even better, a transactional model. This model assumes that a variety of factors may have their source, at different points of their development, either in their constitution or in the outside world, exerting influence on the central nervous system. All these factors actively participate and interact with each other and are therefore plastic modifiers. The transactional model does not assume directionality in development that gives greater ideological importance to one particular factor.

It appears that scientists as well as journalists have great difficulty in applying such transactional thinking. And I would like to mention a few reasons why I think that is so. There are some traps which both scientists and journalists fall into again and again which impede the investigation of human behavior and the accurate reporting of such investigations.

At this point in time, no scientist or journalist should be unaware that human gender-related behavior is determined by many factors. However, we continue to reduce the roots of behavior to one

variable. You have several examples of this in your conference reading material. The math gene is one of the most recent examples. Investigators contribute by not collaborating with those in the other disciplines, thus making it impossible to link their knowledge with that of others.

I think that the difficulties really begin with terminology. The dichotomies of nature versus nurture, constitutional versus acquired, and heredity versus environment reflect a bipolarity that does not exist. The bipolarity is a false one, since both social and biological influences affect behavior through the central nervous system, irrespective of how they gain their entry—either internally, by way of genetics, for instance, or externally, by way of stimuli transmitted through the senses from the environment.

Learning and memory are just as much biology as a process of DNA replication. Now why is that distinction made over and over again? I think, in part, because we divide those different classes and influences into immutable, and that usually means biological, versus modifiable, and that usually means learning. Obviously, that's another trap, if you follow my thinking, since all effects are more or less modifiable.

For instance, enormous importance has been attributed to the influence of sex hormones on gender-related behavior. According to my thinking, sex hormones play a part, but they only play a limited part in a whole network of factors in the

etiology of some very specific aspects of behavior. One should certainly never assume—there is no evidence—that sex hormones have a major or predominant influence.

For example, testosterone may increase sexual desire. Sexual desire, under certain circumstances, may lead to sexual behavior. But then, and that's very important to keep in mind, sexual behavior may then affect

the testosterone level. Or hormonal fluctuations in some women may, throughout the menstrual cycle, affect mood. But also mood and stress may affect the hormonal fluctuation and menstruation.

My own research has particularly involved the role of prenatal hormones and the development of sex differences of behavior. Now I think that the misinterpretations of my work have usually happened when my research has been thought to support a simple-minded, biological, deterministic point of view. My own thinking is that variations of sex hormones before birth may predispose some specific behavior tendency, such as, for instance, a propensity to physical activity level. However, there is no question that the positive or negative social enforcement will determine whether that physical activity level will be amplified, modified, or altogether suppressed.

Not only is it important to see sex differences as the end result of the complex interplay of various factors. It is crucial that we not exceed the boundaries of our information.

As an example, if boys show, on the average, a stronger propensity towards physically active play than girls, we should not and cannot extrapolate or conclude that girls are more passive, more dependent, have less initiative, less leadership behavior, or are generally less assertive and could not, therefore, become airline pilots or president of the United States. A difference in physically active play behavior may be simply a difference in physically active play behavior. When we generalize, we not only become imprecise, but we perpetuate stereotypes.

One last point. To include constitutional variables in the analysis of sex differences of behaviors, such as sex hormones, evokes heated political arguments from opposite sides. Those concerned with defining human behavior in a less prejudicial and restrictive way for both sexes become deeply alarmed by the attribution of biological factors to gender differences. And those on the other side, holding views of prescribed roles for men and women, proclaim biologically-rooted differences as the final truth. Both points of view lack the perspective an interactive model would provide. Both sides ascribe power and importance to biological variables that are not justified—except in what now should be outdated thinking.

Our newly-acquired knowledge on biological factors and gender differences in human behavior is so far very preliminary and fragmentary, and it behooves us to be cautious in interpretation and reporting. But it is clear now that we have no support for the notion that biology is destiny. ❸



Learning and memory are just as much biology as a process of DNA replication.

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# INTERPRETING STATISTICS

## What Did You Expect?

BY DAN WARTENBERG

I am going to talk about three problems that are important for journalists and scientists to know about. The first is the concept of multiple testing: how many times do you test something, and how does that affect the interpretation of statistics? There is also a question of data standardization: what did you really expect to occur, and how does that influence the interpretation of the results? Finally, there's the question of statistical power: what does it mean if you get negative results?

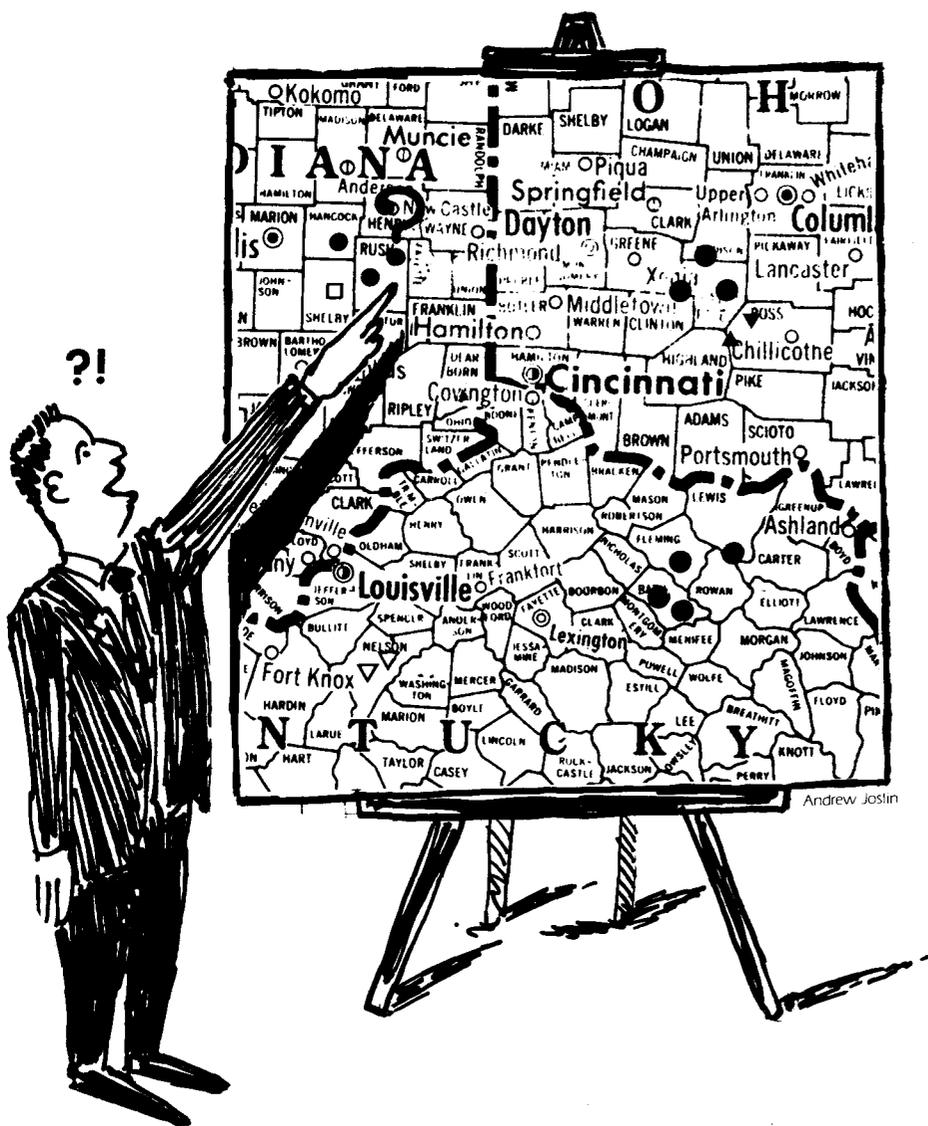
The first question relates to some of the work that I do, and it has to do with clusters. Just what is a cluster, and when do you think you have a cluster? A lot of times there will be a health outcome, like cancer or birth defects. And people will say, "Gee, that looks pretty unusual." So we think that it's a cluster, since it's unusual and there are a large number of cases, either close together or aggregated in some other way.

What do we mean by an unlikely chance? It shouldn't happen 1 in 10 times? Or you wouldn't expect it to happen 1 in 100 times, unless something unusual were going on—something like that. Then it becomes important to ask, "Well, how often did we look?" If we were looking at a cluster in a neighborhood of a few blocks, then we could look at all such areas in the United States too, and there might be millions of them. If we looked a million times, we might expect to see this cluster 1,000 times, just by chance alone. As it turns out, we really have to ask the context in which we were thinking about this cluster, and how often we asked the question, "Is this unusual?"

A similar sort of thing happens when one looks at cancer rates and then ranks them. You might see in the newspaper that some county or town on Cape Cod has the highest lung cancer rate in Massachusetts. And people say, "Well, there must really be some problem there. I wonder what's causing that." Again, it really depends upon how you ask the question. In fact, it may be true that there's a problem. There may be something that people are being exposed to.

On the other hand, we can take the cancer rates for the 351 towns in Massachusetts and order them, and there is always going to be one that's the highest. That's the consequence of ordering them. So if we then say that it happens to be this

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town out on Cape Cod, there might not be a problem. That's just a natural variation in numbers, and finding the highest one doesn't tell us there's a problem. What we really want to know is, "How high is it?" How different is it from the other rates? How unusual is it?

On the other hand, what if someone had come and said, "I think there is a real problem in this town. Would you look at the lung cancer rates?" And if you look at those rates and find that, in fact, that town has the highest lung cancer rate, then we've gone about the problem in a different way. We've asked that if we pick a town at random, how likely is it that town will have the highest cancer rate? And that chance would be 1 out of 351. The fact that we hit it is pretty unusual, so that suggests that there might be a problem.

### Looking for Causes

What I'm getting at is that one has to look for causes. You can't just say that something's unusual or that it's a cluster, and therefore we have a major public health problem. When we find some sort of data that suggests an unusual situation, that should prompt us to ask, "What's causing it?" You shouldn't just accept the statistics as showing that there's an unusual situation.

There is even a question about how one asks, "Is it unusual?" What do you say if someone says, "We just found five new leukemias in Woburn"? How unusual is that, over the past two years? Or what if we didn't find any over the next five years? Is that unusual? What they're not telling you is very important, which is the number that's expected. What is the expected value of the number of cases of cancer or the number of cases of leukemia? I think that's a really important question that journalists have to ask.

When someone comes out with a number and tells you, "We just found this rate that's very high," we have to ask, "What did you expect? And how different is it from what you expected?" There are a variety of ways that one can do that. It depends on, in the case of leukemia rates, the number of people that are considered, for one. How many children are there in Woburn that we might want to consider in deciding that there is an unusual number of leukemia cases? Often, people will report data in terms of rates, like standard mortality ratios or some relative risk.

Getting back to clusters, one of the things that people often forget to adjust for is population. In an article published about a particular type of cancer, there's some data that looks like clusters—but look, one's in New York, and one's in Buffalo,

and one's in Syracuse. So what's happening is that there are more cancer cases, but there are more cases because there are more people in those cities. The rates might not be high. And that's the point of the article: that we have to adjust for population, and we have to talk about rates in proportion, not numbers, or else they can be very deceptive.

### Standardizing Data

In a similar incident, I worked with people in a county health department looking at how groundwater contamination had spread from a certain source. We looked at how many wells were contaminated as we went away from the source. They published a report saying that most of the wells that were contaminated, over 80%, were within 500 feet of the source. And once one got out to about 1200 or 1300 feet, they said there was no chance of contamination.

Well, I went back and looked at the data and asked, "How many wells are there that are greater than 1500 feet away?" And it turned out that there weren't many. So when you normalize for the number of wells out there, you have a 10% chance of having a contaminated well, even if you live over 2000 feet away. They were drawing the wrong conclusion because they weren't standardizing their data to what was expected. And that turned out to be a very important problem. They were telling people that if they lived more than 1500 feet away from this source, they didn't have a problem. That wasn't true. It just meant that you probably didn't have a well that you were drawing drinking water from. But if you did, you had better worry.

Also, people often forget to consider confounding variables—variables that are likely to be misleading. One factor that's often ignored is age. You can look at general cancer rates and it may turn out that there is a community that has a very high cancer rate relative to another community. Again, you have to ask, "What is expected?" If it turns out that the community that has the high rate has many very old people, that may not be surprising. In fact, it may turn out to be a low rate. So it's very important to consider the other factors that could contribute to the outcome that you're looking at. Have those factors been taken into account?

Finally, I want to mention the topic of negative results. People put a lot of credence in them. A common example is dioxin—it seems to be pretty popular today—where there are reports that scientists looked for epidemiological effects from dioxin and couldn't find them,

so it must not be dangerous. A recent *Scientific American* article states, "Concern that this material is harmful to health and the environment may be misplaced. Although it is toxic to certain animals, evidence is lacking that it has any serious, longterm effects on human beings."

Well, if evidence is lacking, does that mean it's safe? I'm not saying whether it is or isn't. It just seems that conclusion is completely unjustified. We don't have sufficient information. So what we have to ask is, "Why didn't we find it if we looked? What was the problem?"

### Finding an Effect

That gets into the issue of statistical power: if there is an effect, how likely are we to find it? This is a very complicated concept, and lots of scientists don't utilize it in designing their studies. Epidemiology is a very difficult science—a lot of people I know say it's like using a blunt instrument to try and find something.

So the fact that we can't find an effect doesn't mean that it's not there. It means that our methods are just not quite sensitive enough to pick it up. It might be that we have to see a five-fold increase in a particular outcome, such as a type of birth defect, to even begin to suggest that it was unusual. Well, that doesn't mean that if it's less than that, there's nothing going on. It means that our methods are not very effective at picking this up.

In looking at results, it seems important to ask the question, "How big an effect would you have to have before you found it?" Could you have picked up a doubling of the rates? Or even one-and-a-half times the rate? If you're looking at a disorder that's very common in the population, it's a very small fluctuation. If it's a disorder that's very rare, it's much more difficult to find in the population. That doesn't say anything about the effect; that just says whether or not we can find it. You also have to ask how big the study was. If you looked at 10 people, it's going to be a lot tougher to pick up an effect than if you looked at 10,000 people.

These are issues related to statistical power that are very important. People should be very cautious about taking negative effects and assuming that we have, in fact, proved something. We haven't. When we're trying to disprove a null hypothesis—for example, that dioxin is harmful—and we can't, the converse—that dioxin is safe—just doesn't follow. What it shows is that, at this point in time, we have not been able to demonstrate that it is harmful. But maybe we haven't looked at it the right way or asked the right questions.



# NOT IN ANYONE'S BACKYARD

## Communities Fight Nuclear Waste Dump Siting

BY DAN GROSSMAN  
AND SETH SHULMAN

In a surprise victory for the anti-nuclear movement, the Department of Energy (DOE) reversed itself and decided to "indefinitely postpone" its search for a second high-level nuclear waste repository. This turnabout followed the DOE's selection, in January of this year, of 12 sites for a second repository for high-level radioactive waste, which caused a furor in seven states east of the Mississippi River.

The nuclear waste issue, which pitted states and local communities against federal representatives, has raised public sentiment against the whole nuclear industry. Public meetings this spring in communities like Naples, Maine and Asheville, North Carolina drew thousands of concerned citizens, often lasting into the early morning hours. Within a few months, large community groups mobilized, raising hundreds of thousands of dollars to fight the siting of nuclear dumps near their homes.

Alan Philbrook of the Maine Nuclear Referendum Committee claims that it was the opposition of citizens in Maine and other states to the crystalline repository that caused DOE to cancel the program.

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*Dan Grossman is a graduate student of science policy and American politics at MIT and is a member of the editorial committee of Science for the People.*

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*Seth Shulman is a freelance writer on science issues and coordinator of Science for the People's editorial advisory board.*

"The citizens made the difference," he says. "DOE saw the reaction in Maine and they retreated."

The DOE's nuclear waste program is designed to dispose of 12,000 tons of highly radioactive spent fuel rods that lie in cooling pools at nuclear power plants across the country. In the next decade, the amount of nuclear waste in storage is expected to almost triple, filling many of these cooling pools to near capacity.

In addition to this commercial waste, DOE stores one million cubic feet of its own liquid, highly-radioactive waste at three sites, the vast majority of it resulting from the production of nuclear weapons. Because this waste is extremely hazardous, DOE believes that it should be isolated from the environment and human contact for at least 10,000 years, necessitating a permanent disposal facility.

Some of the high-level nuclear waste, both from commercial plants and from nuclear weapons manufacture, has been held in "temporary" on-site storage for as long as thirty years because no permanent facility has ever been built. At the site in Hanford, Washington, where much of the liquid high-level waste is stored below ground, one storage tank alone is known to have lost 115,000 of its 500,000 gallons, seeping into the ground and risking contamination of the groundwater supply and the Columbia River.

The Nuclear Waste Policy Act (NWPA), signed into law by President Reagan in January 1983, mandated a solution to the high-level nuclear waste problem by requiring that DOE develop

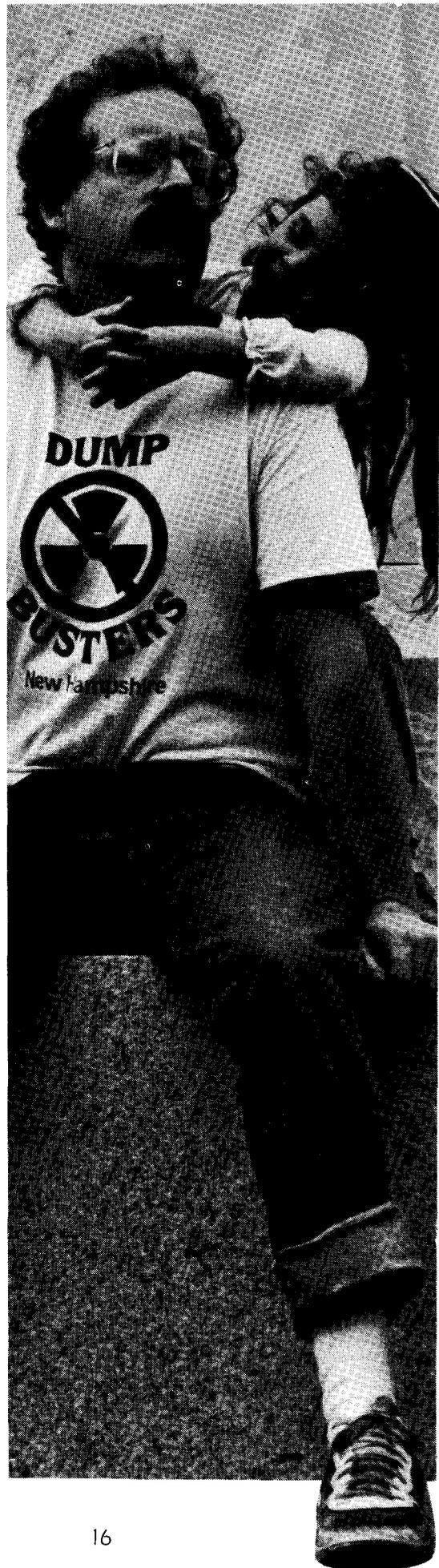


Photo: Ellen Shub

plans for two permanent, so-called deep geological high-level nuclear waste repositories, or "national sacrifice areas."

The power utilities' lobby was a major driving force behind NWPA. They faced criticism that there was no safe way to dispose of the waste from nuclear power plants, according to Rep. Edward Markey (D-Mass.), chair of the Subcommittee on Energy, Conservation and Power, who voted against NWPA in 1982.

The lack of a national disposal plan threatened to halt the growth of the nuclear power industry. California, Wisconsin, Massachusetts and other states even passed laws which prohibited the construction of new nuclear plants until a safe method of permanent disposal was demonstrated. The desire to show that nuclear waste could be handled safely led Congress to include a very explicit and strict schedule in the act for each step of the process leading to the two repositories.

The proposed facilities would deposit the waste in mines 1,000 to 4,000 feet deep at sites with one of three types of rock formations: salt, basalt (solidified volcanic lava), or tuff (solidified volcanic ash). Until the recent DOE announcement, a fourth type of rock, crystalline, such as granite that's located in midwestern and eastern states, was also under consideration for the second repository. Prior to DOE's

recent decision, the second repository was scheduled to follow the first by approximately seven years, each facility costing approximately \$6 to \$9 billion.

DOE justified its decision to drop plans for the second nuclear dump, citing satisfactory progress on the first repository, revised projections of the amount of nuclear waste that will be generated, and the expense of the search for the site. Secretary of Energy John S. Herrington said he believed the decision was "in the best interest of the American people and the most effective course for implementing NWPA."

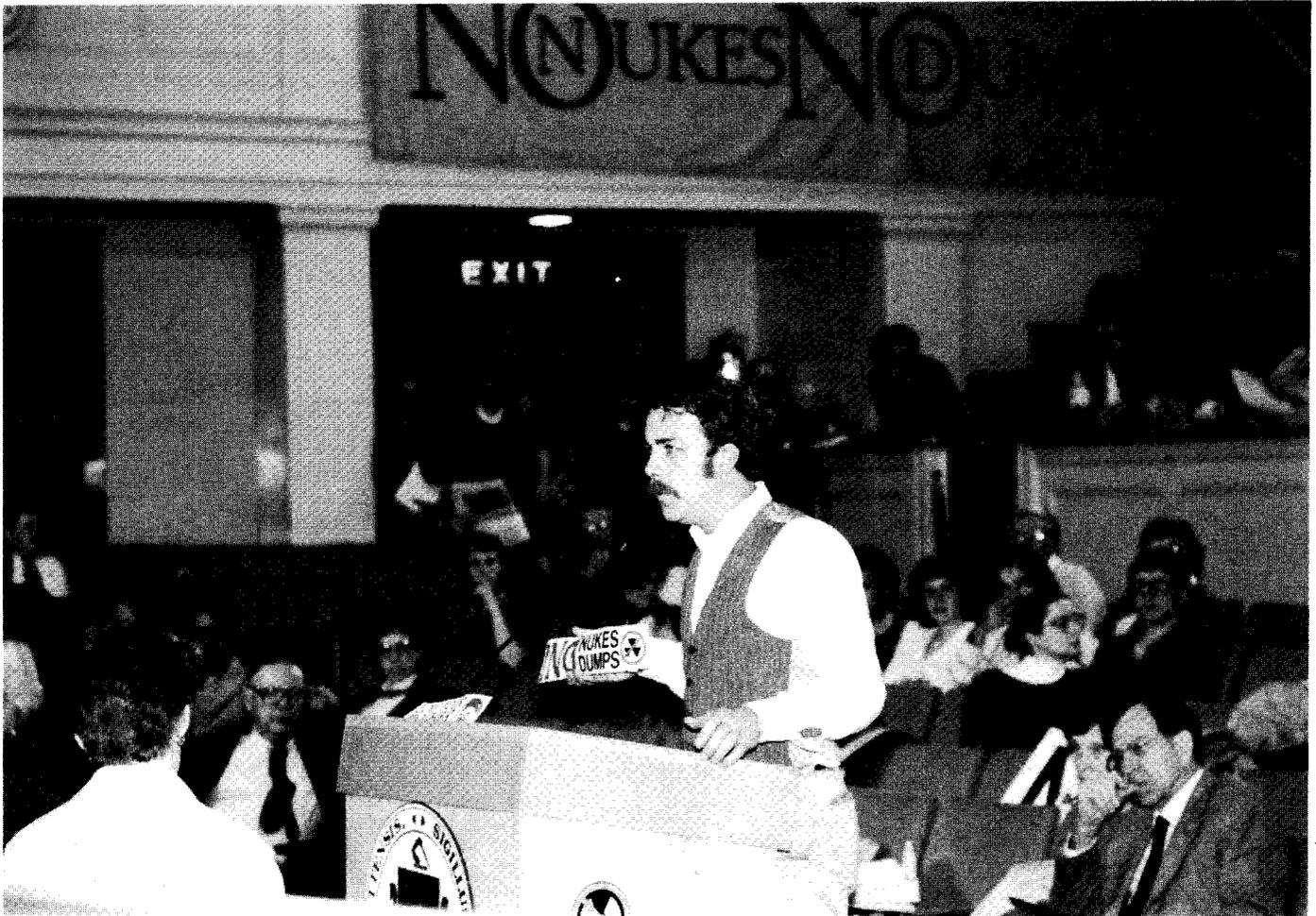
But citizen opposition to the second nuclear waste dump was probably a stronger factor in the DOE's pirouette. Protest over the proposed second site was fierce in all of the seven states targeted in the January report, taking DOE officials by surprise. "The people are very energized," remarked Philbrook in May. "We almost had open revolution."

Ironically, the protest threatened the very nuclear power industry NWPA had been written to rescue. In Maine, opposition to the nuclear dump has led to widespread calls to shut down the state's one nuclear plant, Maine Yankee. While citizens voted in favor of Maine Yankee in two previous referenda, in 1980 and 1982, a poll conducted by the Associated Press

since DOE's decision found that 58.5% of Maine voters favored closing the plant immediately. Similarly, in Maine's coming gubernatorial race, eight of nine candidates also favor shutting down the plant.

At the request of Maine Governor Joseph Brennan, a proponent of nuclear power who has actually appeared in statewide advertisements paid for by the nuclear power industry, a study was recently completed of the costs of shutting the reactor down. Stating publicly that he is reconsidering his support for Maine Yankee, Brennan asked an audience of 2,300 at a DOE briefing this spring, "Isn't it logical to say if we don't want [a nuclear waste repository] here, you should say we close that plant?"

But Maine was not the only state promising stiff opposition to DOE's plans for the second repository. Angry protesters opposed the proposed facility in all six of the other states under consideration. Wisconsin Governor Anthony Earl told the House Subcommittee on Energy Conservation and Power this spring, "We haven't purchased any F-111s yet, but we expect to use every technical and political resource at our command in order to keep this dump and all of its problems out of Wisconsin." In Asheville, North Carolina, a resident told DOE officials at a public meeting, "I will never let anyone on my



Photo/Ellen Strub

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property to do any testing and, if necessary, I will die for it."

Not only was DOE opposed at the grass roots, but many aspects of its program, including the strict timetable in the act and DOE's site selection process, were under fire at the national level in Congress and the courts. David Berick, director of the Nuclear Waste and Safety Project of the Environmental Policy Institute, believes DOE attempted to make up for missing its own deadlines under the NWA by shortening the time allotted for public comment on the draft report which originally announced the sites under consideration for the second repository. "The timetable was never realistic," he stated.

And still facing criticism was a provision of the act which states that DOE will take responsibility for the utilities' nuclear waste in 1998. If, as appears likely, the first site is not ready to open by that date, DOE will have to find other ways to accommodate the law, such as by paying the utilities for continuing to store the nuclear waste themselves—an ironic prospect.

DOE's implementation of the act was under fire as well. The Environmental Policy Institute is currently awaiting a decision on a suit filed in the U.S. 9th Circuit Court of Appeals in San Francisco challenging DOE's site selection guidelines. "There is not a single factor, either geologic, or environmental, or transportation, that actually gets resolved in the screening stage," says Berick. "It allows DOE to make highly subjective judgments. The less information, the better a site looks, and therefore the more suitable a site is." For instance, according to DOE's guidelines, there is no aquifer in the U.S. which is so valuable or so irreplaceable that it could not be put at risk when considering the location of a nuclear waste repository, at least in the early stages of the site selection process.

In Congress, a number of amendments to NWA were proposed to halt the second repository program. One of these, S-2354, sponsored by Senator George Mitchell (D-Maine), would eliminate the automatic assumption by DOE of responsibility for the commercial nuclear waste in 1998, abandon plans for a second repository, and remove the cap of 70,000 metric tons allowed in the first repository.

**T**he recent victory for opponents of the second repository may turn out to be pyrrhic, or at best short-termed. Sponsors of NWA, and western congressmen and governors who feel that the bargain upon which it was based has been violated, are attacking DOE's decision. The state of Washington, which previously endorsed the site selection process, has now joined Nevada to challenge DOE's policies in court. These western states

maintain that DOE will be unable to select three candidate sites for the second repository by the 1989 deadline, as mandated by NWA, and is thereby currently violating the spirit of the law.

Meanwhile, on the federal level, two Washington congressmembers have introduced legislation to amend NWA, requiring DOE to follow what they see as the original intent of the act. This legislation would halt the siting process until the second tier of sites is reinstated.

In addition, more than a dozen members of the House and Senate have written a letter to Secretary of Energy John S. Herrington, questioning the legal basis for DOE's elimination of the second site. One of the authors is Senator McClure (R-Idaho), chairman of the Senate Energy and Natural Resources Committee and sponsor of the original bill, who believes that DOE's actions may be in violation of NWA.

Representative Edward Markey, who also believes that DOE lacks authority to postpone selection of a second nuclear waste dump, questions why the agency didn't recommend amendments to the NWA instead. "A postponement will keep a nuclear cloud hanging over the twelve sites that have been selected as potential second-round repository sites. Citizens in these seven states may well be in nuclear limbo for years," he claims.

Unfortunately, whatever the results of these challenges to DOE's recent actions, many tons of waste are already in storage and have to be safely disposed of somewhere. Some observers in the environmental movement see DOE's decision as detrimental to the program's ability to safely dispose of this waste. "DOE's decision amounts to putting all our eggs in one basket," says Brooks Yeager of the Sierra Club, "and the basket doesn't look very good."

So far, there does not appear to be sufficient support to reopen NWA, either by proponents or opponents of the recent decision, because the compromise which gave birth to the bill would be irrevocably lost. But some fear that the compromise has already been violated and that the program is doomed. According to David Berick of the Environmental Policy Institute, "Its a foregone conclusion that this program is mortally wounded."

In Congress and in court, in city halls and on Capitol Hill, almost every aspect of the nuclear waste disposal program is being questioned. But whatever the outcome of these disputes, the decision about where the waste will ultimately rest is certain to be controversial. Even DOE acknowledges this. As Bernard C. Rusche, head of the Office of Civilian Radioactive Waste Management of DOE, stated, "We know enough to do everything we are talking about. We just have to find the right place to do it."

# GESUNDHEIT INSTITUTE

BY PATCH ADAMS

**W**hen I went to medical school, I was very interested in the roles of the physician in society and appropriate health care delivery systems. I grew up a science nerd, with laboratories instead of baseball bats. There was never any doubt that my career would be in science. The civil rights movement and the fervent antiwar movement were instrumental in directing the focus of that science toward social change. I feel that all my life that focus has led me to the medical field.

I entered medical school in 1967 a very self-confident person, with a zeal for voraciously interviewing and reviewing all those connected with the health care field—doctors, students, nurses, orderlies, patients. I sought out literature, both lay and professional, about all aspects of health care delivery. I was looking for clues on how best to use my training for social change.

It was becoming obvious then that big changes were occurring in medicine which would undermine its focus as a service to society. Medicine was becoming big business. In fact, it was becoming the biggest business in the United States. The focus of the delivery systems seemed to be on how to produce maximum profit from people's suffering. And what a perfect alibi—to do this in the name of helping humanity.

What's more, a perfect fail-safe tool was at the core of this extravagance—third party reimbursement. In the name of equal access to all people, insurance companies and the government agreed to fund whatever measures were necessary to insure good health care for all. Rampant waste became the profile for health care delivery.

The cost of care, of hospital beds, has become so great that, were these reimbursement companies to cease payment, the whole system would collapse. It was not long ago that even blue collar workers could pay medical bills from their wages.

*Patch Adams is a physician and founder of the Gesundheit Institute, which is located at 404 N. Nelson St., Arlington, VA 22203, telephone 703/525-8169.*

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Hospitals, formerly the pride of a community and symbol of its caring, became a prime market for investment. With flagrant conflict of interests, physicians were found investing in labs, hospitals, and supply companies. In medical schools, students spoke of wealth as their motivation, and attending physicians spoke of investments while scrubbing for operations. Where were the echoes of the thrill of serving humanity? And if the healing arts were so concerned about containing costs, why did we have so little, if any, training in prevention of disease?

Another pernicious element beginning to surface in 1967 was the specter of malpractice. Here was a force taking away the physician's humanity—their right to make a mistake, and their right to intuition. A complex system of defensive medicine was developing, further driving up costs by high insurance premiums and because physicians would over-order tests to protect themselves. Diseases began to have standard treatments, and even if they weren't successful, it was better to do those than try something new, because the threat of malpractice charges brought fear. How can the doctor give meaningful medicine if every interaction has this element of fear?

One of the saddest conclusions from all of my investigations was that there was a

widespread dehumanization of care. How could a physician know a patient in a ten-minute interview—especially in a group practice where patients might see a different physician each visit? There were no required lectures on developing a close rapport with patients. There were no lectures on what constituted healthy living or any preparation for the horrendous, agonizing family and individual suffering that would confront the doctor every day. Patients were reduced to their diseases, and often attendants wore their prejudices on their sleeves.

All of these problems are overwhelming to a medical student who cannot find models to follow outside of this system of greed, paperwork, fear, and alienation. One can go to the Third World and find a meaningful niche, but here in the United States none were visible or encouraged. I knew I could not practice this style of medicine because it would hurt me. I would not because I felt medicine should be a service to all people—a loving, moving interchange among friends. I would not cheat the patients by giving less. But just as true, I would not cheat myself. I decided my senior year to design a practice that would address all of those issues head on.

For the 15 years I have been in medical practice, we have never charged money, accepted third-party insurance, or carried malpractice insurance, and we have opened our home to all who came. For the first eight years, a group of 15-20 staff lived in a large single-family dwelling in a suburban country setting where we could farm and develop outdoor programs.

We saw 15,000 people from all over the United States for all kinds of medical problems. Those people who needed inpatient care we admitted to our house, if possible. Only about 15 had to go to hospitals. Over the most active period, 500-1000 people came per month, with 5-50 guests per night. We fed all, helped many find jobs, and tried to help people become more interdependent in their community. Not only did we not charge money, but the staff worked part-time jobs to pay to give care to others.

Our ideal patient was someone who wanted a deep personal friendship for the rest of our lives, so we wove our medical work with social work and recreational

activities, as an exuberant extended family. The structure was one person, one vote, with any new staff requiring a unanimous vote. The tasks were shared by all, including the visitors, who were usually anxious to help with the cleaning, farming, and cooking. We wanted to be accepting of all who came, so we had very few rules, but prohibited physical fighting and hard drugs.

After eight years, many of the support staff were burned out and tired of waiting for a facility. All along, we dreamed of building a facility with beds, space, and

equipment to offer much wider care. Rather than power play the disenchanting, we let them keep the beautiful property we had acquired, and we chose to regroup. Those people should be saluted for lasting so long—after all, we had nothing resembling a private life.

For the next four years, we tried to see patients in a modified style, and put more time into fundraising. With the large demand for—and thrill of—caring, fundraising took a backseat. But this was unacceptable. We had a huge staff ready if we got a facility, and we old-timers longed

for the style we had before. With some fear, we decided to forego the ban on publicity and go to the nation for help.

For three years now, we have devoted the bulk of our time to raising funds and building a facility in an under-served area in West Virginia. We shall still be open to all people—it's cheaper to come there from anywhere in the U.S. than the first day in any hospital in the country. We regret not seeing patients, but realize that for the bigger picture of social change, we need to have a model that's operating. We have enough staff for five free hospitals, but to operate on the old frontier style would burn many of them out quickly.

There were problems in our crude facility, where even the staff did not have a room to retreat to. Part of why we are now waiting for a facility rather than continuing in the frontier style of our past is that we do not want to waste the great folk ready to make the sacrifices it takes to live with patients. The new facility will have a room for each staff person and space for each to develop their own interests. We want it to be too fun and enriching to leave.

Our major problem has centered around establishing believability. Even with free labor to build, we need a million dollars to get our first facility, and after 15 years we are just beginning to have the respect that attracts funds. Since our kind of care costs \$2000-\$4000 per week on the market, we have had investors willing to build for us for profit.

Impatience could make that look attractive, but with 15 years in a glorious, fun practice, most of that impatience is gone. The bottom line for me is that the lived experience has been too rich and dynamic to consider alternatives. I see no alternatives out there where practitioners are ecstatic about their healing lives.

Another problem is patient oriented. When one wishes to focus care on trying to prevent illness and stay away from unnecessary, potentially dangerous treatments, one realizes it is not just "the system" that is the problem. Less than five percent of our patients really want to address their lifestyle, and would rather take pills. We find that we have to have contact for years to really see meaningful lifestyle changes. But this closeness is part of our freedom from fear of malpractice. It is also our security in times of need.

I cannot really describe the thrill these past 15 years have been. From the book-smart student, I have learned to farm, herd goats, build houses, produce plays, and ride unicycles, to name just a fraction of what has been my reward. The day-to-day love has made the experience the thrill of a lifetime. And professionally, as a doctor and scientist, the joy of living a life in service to this great planet is an honor without complaint. I believe I could not be a greater revolutionary for social change than to carry on this work.

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# CHERNOBYL WAS INEVITABLE

Analyzing Anti-Soviet and  
Industry Propaganda

BY GERRY WANECK

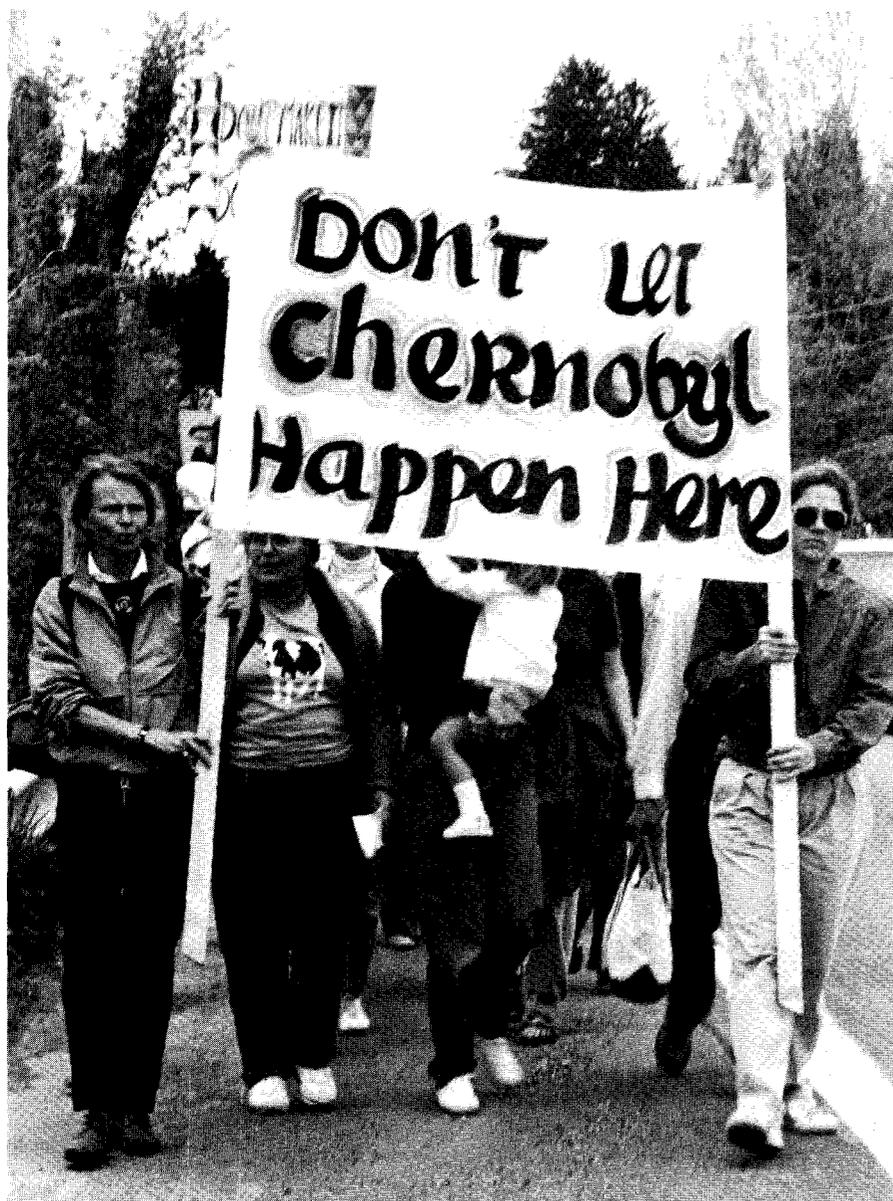
The world first learned of the nuclear disaster at Chernobyl when a Swedish monitoring station detected a large surge in the level of background radiation. Based on the composition of radioactive isotopes in air samples, together with the aid of satellite photography, Western experts concluded that a serious accident involving the reactor core had occurred at the Chernobyl nuclear plant.

The death toll was believed to be in the thousands. Europe was threatened by radioactive fallout, especially if the meltdown were to spread to the other three reactors at the site. Politically, the incident was worsened by the failure of Soviet authorities to acknowledge the accident until 48 hours afterward.

During this time, U.S. anti-Soviet rhetoric was plentiful. The incident was used by the Reagan administration to undermine any trust of the new Soviet leadership toward agreements on nuclear arms control. When the Soviets reported that initially only two people had died and 195 were hospitalized, the world reacted in disbelief and further distrust. In the U.S., representatives of the nuclear industry extolled the merits of the better containment design of American-built reactors, and assured the public that our technology is superior, and our concern for safety higher than that of the Soviets.

Then the reality of the situation began to emerge. This nuclear accident was indeed the most serious to date, but not a complete meltdown as initially feared. Like other accidents involving complex technologies, such as the partial meltdown at Three Mile Island, the chemical disaster in Bhopal, and the space shuttle Challenger explosion, a combination of

*Gerry Waneck is fundraising coordinator for Science for the People. He is a scientist, environmental activist, and longstanding opponent of nuclear power.*



Marchers at National Day of Nuclear Protest, May 24, 1986, in Seabrook, New Hampshire.

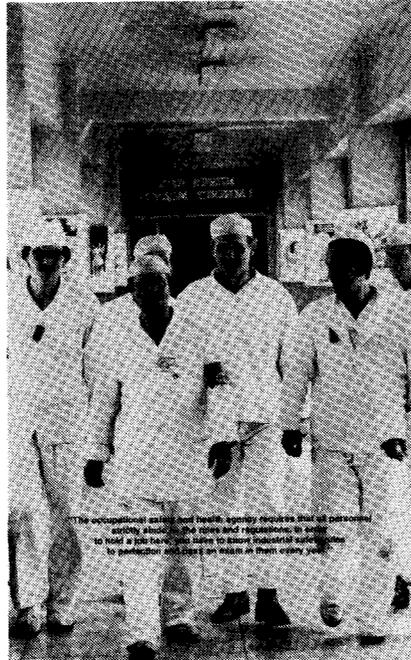
Photo/Ellen Shub

faulty equipment and human error was responsible.

Just as the plant operators at Three Mile Island initially underestimated the severity of that accident and then failed to warn officials for 24 hours, the Chernobyl operators reacted in kind. When the Soviets finally realized the extent of the crisis, 92,000 people were evacuated in 36 hours. Many of these people had already received dangerous levels of radiation, and most will never be able to return home because of widespread contamination.

In retrospect, the silence of Soviet officials, while inexcusable, related more to their own ignorance in understanding and managing the situation, and their preoccupation with evacuating the area and bringing the fire at the reactor under control. One can imagine how a similar situation might be handled by authorities in the U.S., or in other countries with nuclear plants close to population centers.

Now we have learned that differences in design and containment between U.S. and Soviet reactors have been exaggerated by the U.S. nuclear industry. Although most U.S. reactors use water rather than graphite to moderate the reaction, 38 plants in the U.S. built by General Electric use huge outside ponds of water underneath the reactor, like the Chernobyl plant, to relieve steam pressure in case of an accident. Should this emergency system fail, as it did with Chernobyl, and



Workers at the Chernobyl plant pictured in Soviet Life, February 1986.

Photo/Soviet Life

should a complete meltdown occur, then the molten core would convert this water into atmospheric radioactive steam. The Soviets barely managed to bring the Chernobyl reactor under control before this happened.

Contrary to earlier reports that the

Chernobyl reactor had no containment (as is the case with older Soviet reactors), the plant was newer in design and able to withstand the same pressures as many American nuclear reactors. Although reportedly substandard to U.S. reactors, the Chernobyl nuclear station used many of the same safety devices as its American counterparts. However, the accident occurred during a routine maintenance procedure and was caused by problems which have plagued U.S. reactors, such as stuck valves and operator errors.

A Nuclear Regulatory Commission safety analysis admits that nearly one-third of U.S. containment structures are likely to fail in the event of a core meltdown. The probability of this occurring within the next 20 years is about 45 percent, according to an NRC report. In the past year, the safety record of the U.S. nuclear industry was the worst since the 1979 accident at Three Mile Island. Thus, comparisons between Soviet and American designs are irrelevant.

No existing plant uses foolproof technology, and the consequences of a meltdown, no matter how remote the probability of its occurrence, are so serious that any benefits of nuclear power can *never* outweigh the risks. Moreover, the death and destruction resulting from the Chernobyl accident is but a hint of what life would be like in the aftermath of even a "limited" nuclear exchange.



## BHOPAL LITIGATION RULING

### India Wins

BY SATISH CHANDRA

**A**fter a poisonous gas leak from Union Carbide's plant in Bhopal, India in December 1984 killed over 2,000 persons, injuring hundreds of thousands more, the Indian government, acting as a guardian of the victims, filed a damage suit, in company with other suits filed by private American lawyers in American courts.

*Satish Chandra is a psychologist and consultant in Cambridge, Massachusetts.*

Union Carbide asked Federal Judge John F. Keenan to dismiss the cases on the grounds that the proper forum for such litigation was in India, where the accident occurred. To obtain the much higher damage awards characteristic of American courts, the Indian government pleaded inability to provide justice to its own citizens, citing overloaded courts and underdeveloped law.

As a citizen of India, I saw the long-term folly of such a stance and filed a friend-of-the-court brief, drawing attention to by-products, regarding dominance

and dependence, of such an abdication of sovereignty and responsibility by the Indian government for the sake of a little bit of money now. In my brief, I quoted the *New York Times*, which said "if the argument (of the plaintiffs in the Bhopal cases) was successful, it would cause many third world countries to bring more claims in the United States." I added, "The results would be multiple and complex, however; for one thing, such a process would consolidate the 'colonial' relationship that exists between the two sides. This may have long-term

# Opinion

deleterious consequences, threatening the very survival of the 'third world' countries."

There was satisfaction, therefore, in Judge Keenan's ruling sending the cases to India, which said, "In the court's view, to retain the litigation in this forum, as plaintiffs request, would be yet another example of imperialism, another situation in which an established sovereign inflicted its rules, its standards and values on a developing nation. This court declines to play such a role. The Union of India is a world power in 1986, and its courts have the proven capacity to mete out fair and equal justice. To deprive the Indian judiciary of this opportunity to stand tall before the world and to pass judgment on behalf of its own people would be to revive a history of subservience and subjugation from which India has emerged."

On the principle argument the Indian government has in the case, that Union Carbide *controlled* its subsidiary in India (and is therefore liable for damages from the accident), my brief supported the Indian government, and even pointed to mechanisms of control that the plaintiffs

had not taken account of. But "control" was precisely the rub, in my brief, because leaving the dispensing of justice for Indian victims in U.S. hands was a further abdication of control and sovereignty. Such a result was to be avoided.

Judge Keenan's ruling transfers the cases to India, but only if Union Carbide agrees to accept any judgment against it in India and to submit to rules of pretrial discovery used in U.S. civil cases, thus giving India, in a sense, the best of both worlds—control over the litigation and access to the assets of the parent company for the judgment.

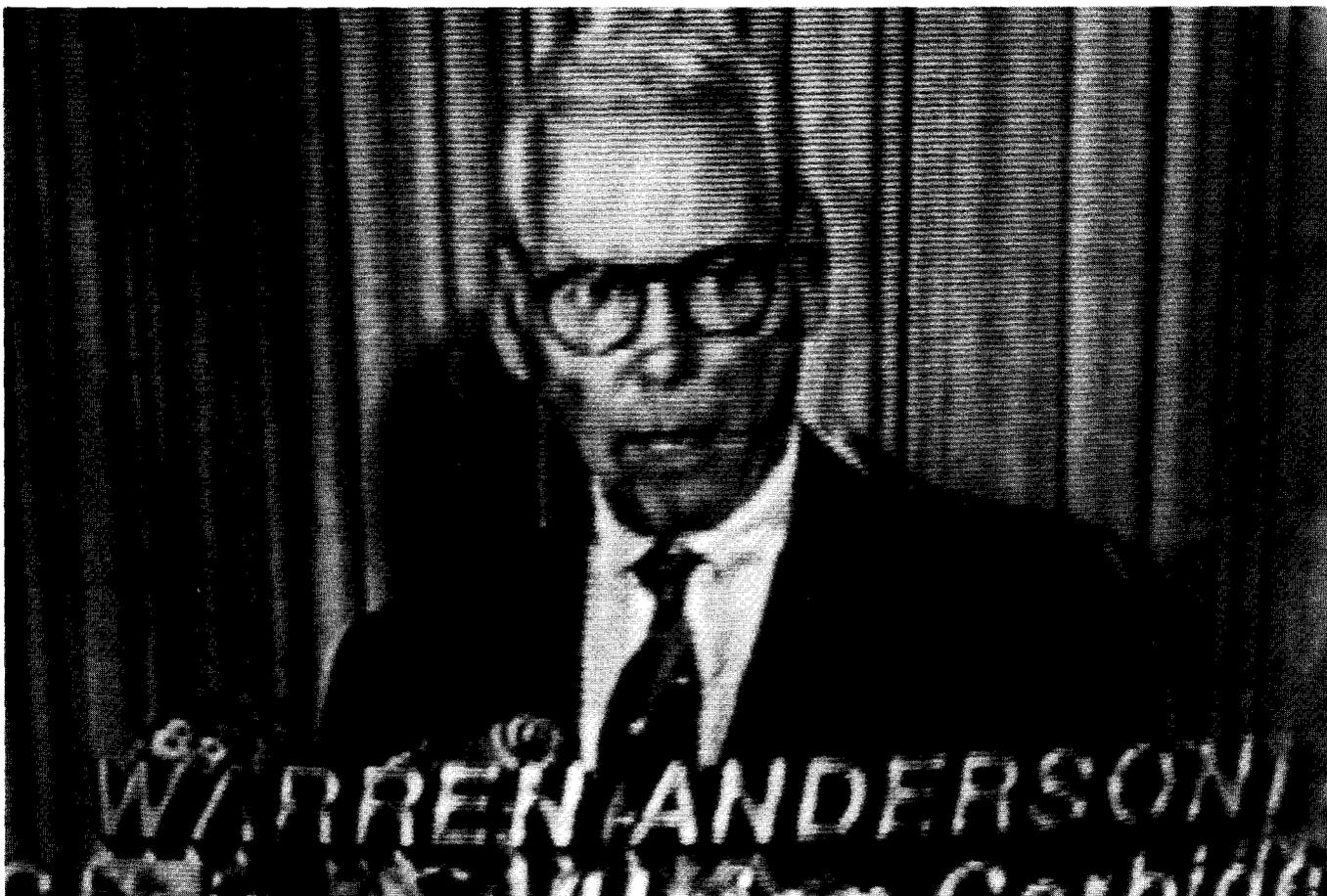
Together with "control" goes responsibility, which is the other part of sovereignty, and the responsibility of the Indian government was also an issue. Union Carbide said that the Indian government wanted the case tried in the United States because India itself is a defendant in hundreds of cases in India. My brief referred to "derelictions of duty" of the Indian government and suggested that insofar as the disaster resulted from conditions the Indian government tolerated, there would be

little incentive for the Indian government to improve unless it faced the task of cleaning up the mess, including the legal and social mess, and little long-run justice for the Indians.

Judge Keenan recognized this when he wrote, "The Indian interest in creating standards of care, enforcing them or even extending them, and of protecting its citizens from ill use is significantly stronger than the local interest in deterring multinationals from exporting allegedly dangerous technology."

There would have been irony in that a United States judge should have had to act as a guardian of India's sovereignty and independence, in the face of the Indian government's subservient stance. But this irony is dissipated by the fact that where the Indian government failed, a private Indian citizen took the responsibility to protect the longer-term interests of the Indian people, and the judge's opinion reflected his brief.

The Bhopal litigation is not over yet, but a crucial step has been taken and, for the moment at least, the Indian nation has been saved from humiliation and defeat.



Warren Anderson, president of Union Carbide, at televised press conference following the poisonous gas leak in Bhopal, India.

Photo/Eileen Shub

# SCIENCE AND GENDER

## Critiquing the Issues/Defining the Terms

BY MARK BRIDGER  
AND MAXINE BRIDGER

**T**he issue of gender and science is, indeed, a very important and timely one. We were therefore pleased to see the attention you have given the subject; for the same reason we were disappointed by the quality of the articles you chose to represent it, particularly that by Barbara Dodds Stanford ("Women and Science," SftP, January/February 1986).

In Stanford's article, we have an anecdotal account of disillusionment with what the author believes to be science. Stanford's connection with science was tenuous at best, and her entire experience seems to be with the very softest of the soft sciences. A course in which a significant question involves "choosing between injustice and chaos" is not a science course. It may be a very worthwhile course for scientists—or anyone—to take, but it is not a science course.

When Stanford offers her views on real science, we begin to see her confusion. She offers the "cold-blooded murder of a frog" as an "initiation" rite into high-school science. Now there are certainly very convincing arguments which can be made about the necessity of each student having to kill a frog in order to see, first-hand, what biological organs look like. But that is not her point: she believes that this dissection was performed to "understand" a frog, and goes on to deny that the "essential constituents of a live frog were present in the pieces of a dead frog."

The fact is that no one presumes to "understand" a frog. No scientist in the world knows how to make a live frog from a pile of chemicals. The goal of the dissection was much more modest: to show students that the organs of which they had read are real, and that they are placed, constructed, and held together in marvelously subtle ways. That many frogs give their lives toward this end may very well be

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*Maxine Bridger is Computer Coordinator and Chair of Mathematics at the Cambridge School in Weston, Massachusetts.*

wrong, but we would hope to hear arguments mostly from total vegetarians. It might be more instructive if the dissection could be replaced by a class visit to an abattoir, but that is another issue. One of the important principles of science—even on a high-school level—is observation of the actual world.

In the very next paragraph she goes on to describe her lack of interest in pouring "liquids from one test tube to another" without regard to whether the molecules might have been part of her own body. This is, at best, mystical; it is most likely just foolishness. Did Stanford expect to discover the secrets of life in a first course in chemistry? Did she object to learning to spell "cat" in kindergarten because it wasn't Kierkegaard?

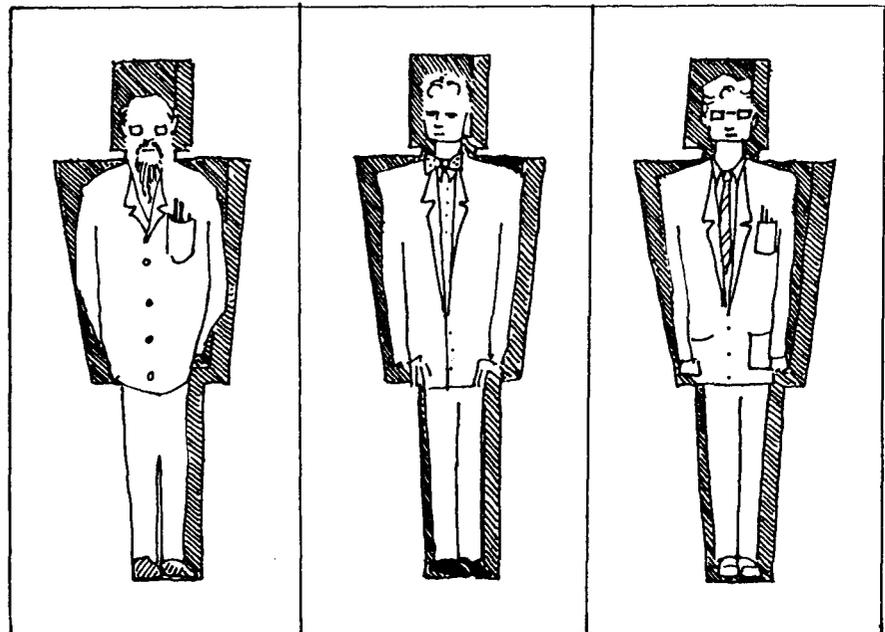
Stanford then veers to a different tack: the lack of responsibility of (male) scientists to the consequences of their research. Now this is hardly a new or even feminist issue, and we will discuss it at length below. Nevertheless, she is rather playing to the galleries when she implies that lack of responsibility is uniquely a male quality; this is sexism. Just to mention one obvious exception: Dixie Lee Ray, a woman, served on the Atomic Energy Commission for many years under at least

three presidents. During that time, if she felt any dissent towards the AEC's cold war policies, she kept it a great secret.

Stanford also invokes the argument about women's "intuitive" mode of reasoning. We have, once again, an account of how women are "yin": holistic, intuitive, nurturing. If the National Science Foundation had given a scientist a grant to investigate this mystical genetic quality of women, and the scientist went on to prove that, yes, women did think like that, would a great victory have been won? Should we also prove that Blacks do, after all, have natural rhythm? We must be a little careful here; the sociobiologists may be right, but let's not concede the game just yet.

Women and men may think somewhat differently because of genetic differences; they almost surely have different viewpoints because of social differences. Whether these differences make their outlook incompatible with "Newtonian" or any other science is another matter altogether. We suggest that no great scientific inquiry is ever launched without a great deal of "holistic" insight. Newton, Darwin, Gauss, and Maxwell were not one-dimensional hacks.

In any case, it is important before



proceeding further to attempt some sort of delineation of the terms which have been bandied about. While it is rather difficult to "define" science, several observations about it can be made. First of all, scientists don't "prove" that some statement about the world is true. What they do is make observations, use the observations to make hypotheses (models), and then see if further observations or internal inconsistencies will disprove these hypotheses. Sufficient evidence may make a scientist very confident indeed as to the validity of a particular hypothesis, but strict proof seems, philosophically, impossible.

In applying this "scientific method", scientists are supposed to adhere to a viewpoint referred to as "objectivity"; that is, they are to treat the items of investigation as pure objects, independent of the observer. The history and psychological/sexual implications of this viewpoint have been the source of much inquiry, most recently in Evelyn Fox Keller's *Reflections on Gender and Science* (Yale University Press, 1985). A good case has been made for the assertion that this "objectivism" makes it easy (but not obligatory!) for many individuals in the scientific community to avoid considering the social consequences of their work. Popular perception of the "objectivist" nature of science has even attracted many individuals who have difficulty viewing the world with anything but detachment.

Nevertheless, the issue is decidedly not the abandonment of the scientific methodology, as embodied in the observation-hypothesis-testing cycle, but, rather, raising the level of consciousness of scientists. Science has had an extraordinary

number of successes in explaining or modeling the universe. There have also been great scientists who have been quite involved in analyzing the consequences of their research (most, unfortunately, after the research, but, increasingly, some before the research is undertaken).

One of the features of the scientific method is the use of so-called "simplifying assumptions". These are, of course, logically necessary: a model of the universe—or even a small portion thereof—which has the same complexity as reality would probably not be a useful model. Contrary to what Ruth Hubbard says in her article "Facts and Feminism" (SftP, March/April 1986), "neglecting friction" is not some scam of Newtonian physics to avoid reality, but rather a stopgap measure to enable one to *begin* understanding reality.

There is a kind of arrogance in ascribing naivete to the great minds of previous generations. Newton and his successors were well aware of friction, turbulence, and many other subtleties which affected the exactness of measurements. Nevertheless, they didn't retreat into paralysis in the face of this complexity, nor did they ignore it; rather, they chose a method for proceeding in the face of complexity. They tried to take the first steps in understanding some aspects of physics by isolating them. This is exactly the same point we made about the frog dissection.

Hubbard also gives us the obligatory lecture on the lessons of the Uncertainty Principle: objectivity is dead because the subject, of necessity, interacts with the object. This bald statement may be OK for pop science, but is a great simplification.

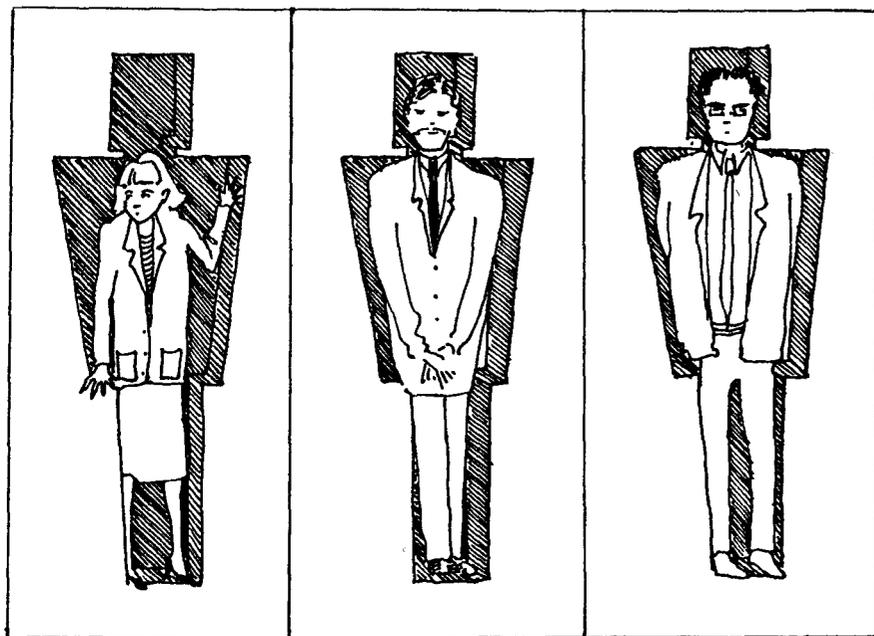
From the point of view of classical physics, the actual interaction between observer and observed can be quantified, predicted, and corrected for—this was never a mystery. For quantum mechanical effects, however, the situation is extremely subtle, since no one knows what meaning to ascribe to this interaction, or even whether "interaction" is the correct word.

There are all sorts of experimental oddities—the Einstein-Rosen-Podolski paradox for one—which call into question any kind of intuitive notion of interaction which most of us might have. Hardly anyone could deny that some sort of more general, "holistic" interpretation of quantum mechanics is necessary. Some scientists are working on this; most are not, which is probably as it should be. All should certainly be aware of the issues. We doubt, however, that much—if anything—of social importance can be learned from quantum mechanics.

The methods of science—observation, experimentation, conjecture, and reexamination—are pretty much fixed, much like the various elements of any trade. It seems unlikely that we could or should replace them with fantasy or mysticism. However, the real-world practice of science, and the development of its practitioners, is very much subject to the political/economic winds which blow. It is this point which Stanford and Hubbard are trying to get at. The *kinds* of questions scientists ask, and the *kinds* of people who get to be supported as scientists depend as much as any other element of a society on the current ideologies and economic policies.

Scientists come in many varieties, and the "political" forces select the successes. When Scientist A was studying the correlation between eye color and reading scores, and Scientist B was studying the correlation between skin color and reading scores, we know who got the grant. While research in molecular biology was deemed *the* proper way to study genetics, Barbara McClintock's research was relegated to the periphery of interest. When algebraic geometry was the hot item in mathematics, combinatorists had to scramble for positions—now the situation has reversed.

Who decides what's in? Mostly white, middle-class male administrators and scientists, responding to current ideology, professional self-interest, and, yes, an honest attempt to choose a path which is most productive for science and society. Why are these "decision makers" drawn from this traditional sector of the population? Once again, simply as a natural result of the forces of selection operating in advanced industrialized countries.



Mirtle Cuéllara

CONTINUED ON PAGE 32

## Sex and Germs

REVIEWED BY  
KENNETH HALE-WEHMANN

In *Sex and Germs*, Cindy Patton allows that "AIDS is a profound assault on the complacent U.S. view of disease: at the very moment in history when disease was declared conquered, a new syndrome removed the very elements within the body that had once cooperated with the doctor's treatment." But she does not take this point far enough: the crisis is not that medicine has been unable to come up with a new molecular intervention to "cure" AIDS, but that it can conceive of no other way of meeting the challenge of AIDS.

A strong case can be made that the kind of medicine practiced today in the United States is hopelessly out of synch with a good many other sciences. Larry Dossey, a physician in Dallas who has written two groundbreaking books on this question, notes that iatrogenic illness—a malady actually caused by the doctor—is "one of the commonest diseases of our day." Horrific anecdotes about maltreatment at the hands of physicians are prevalent—and believable. What is it about current Western medicine that makes it a failure in so many ways?

For many people, experience with acquired immune deficiency syndrome (AIDS) has exposed certain failings of the U.S. health care system as never before. The spread of the syndrome has occasioned a growing radical challenge to technological medicine and the sway it holds over people's feelings of wellness and illness. Deficiencies of Western medicine which might otherwise have continued to lay low, acknowledged by a few with special knowledge but unrecognized by most lay people, now are reported on the "Living" pages of newspapers, along with stories about how people with AIDS and ARC (AIDS-Related Conditions) are working out their own responses to the challenge of AIDS.

*Kenneth Hale-Wehmann lives in Boston and is a member of United Fruit Company, a gay men's political action group.*

*Cindy Patton is a former editor of Gay Community News and works as an ambulance attendant.*

### The Politics of AIDS

by Cindy Patton  
South End Press, 1985  
\$9.00 paperback

Dossey, in his book *Space, Time and Medicine*, puts the predicament of medicine in the industrial world succinctly: "No medicine can be modern which does not square with the best of contemporary physical science." Our view of the physical world has radically changed in this century, so that the concept of matter as distinct from energy, for instance, has had to be discarded. The notion that the universe was mechanistic and objective has been supplanted by the recognition that we are united with all else.

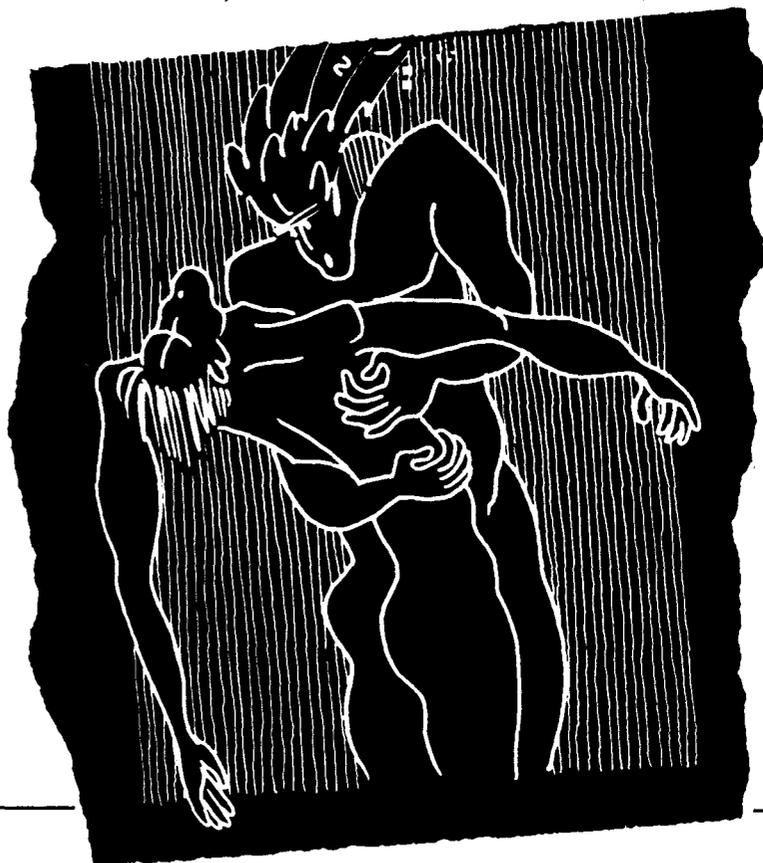
This knowledge contrasts with the working assumptions of most physicians in a striking way. Disorders in the body are thought to be caused by malfunctions

in the operation of molecules, and are treated by the application or manipulation of molecules.

That there could be something more to a body's malfunction than a nuts-and-bolts snafu is a frightening prospect for "health providers," because it can lead to the recognition by "patients" that they have within them the power to influence their body and, with or without the help of a healer, bring their body back to its usual state or ameliorate their discomfort. This recognition, in turn, loosens the grip of established medicine on the provision of health care.

In the case of AIDS, the usual approach of medicine is devilishly confounded because the syndrome weakens the body's immune functions, which doctors rely on to work in conjunction with many cures. Since Western medicine is obviously not on the verge of wiping out AIDS, many have been moved to discover their body's own healing powers, intuitively arriving at an understanding of health that stands in harmony with the view of an interconnected universe.

In *Sex and Germs*, Patton's repeated



references to "the relatively disease-free U.S. citizen" underline her misconception that we in the U.S. are indeed in better health because of high-tech medicine. Although Patton criticizes the "industrial empire" of the medical economy, she gives the medical model itself only superficial scrutiny. She provides a thumbnail sketch of the shift from "pre-rational holism," which "integrated functions and symptoms now considered discrete," to doctor-centered, specialized, mechanistic medicine. She points out that a major part of this shift was the introduction of the idea that "germs" enter the body from outside to cause illness.

Patton ascribes great leaps in the treating of disease to allopathy (the idea that alien entities cause disease), but at the same time, allopathy is recognized as the beginning of a *decreased* reliance on the patient's own impressions of her or his condition, and an *increase* in the authority of physicians over a patient's body.

Patton seems to dismiss homeopathy (a therapy based on the body's capacity to bring about and destroy disease) along with other "organic theories" as ineffectual next to the technological wonders of allopathic medicine. She gives no attention to modern alternative therapies and the success some—such as acupuncture, visualization, and macrobiotics—have had in helping people live with AIDS and ARC.

If Patton's inability to jettison her belief in the saving power of medical technology mars her discussion of the medical response to AIDS, the book is more convincing in its discussion of the political implications of the syndrome. AIDS has touched the lives of many people and politicized some who before 1981 would have denied any interest in things political. The involvement of political neophytes in various AIDS action organizations around the U.S. and in other countries can be seen as inspired by the grotesquely inadequate response from the established loci of medical and political power, as well as facilitated by the substantial savvy of socially conscious gay people.

Patton, recalling the tradition of sex reformers who targeted prostitutes and others perceived as morally weak, observes that "from the beginning, the notion of public health was classist and anti-sex." One example of the public health line regarding AIDS is the often-intoned warning that gay men should settle down and grow out of their incessant search for more and more partners. Of course, one could have sex with dozens of men every week and be at practically zero risk for acquiring AIDS,

if one avoided any contact with body fluids.

But the attraction of the monogamous ideal is so strong and so ingrained that "promiscuity" is often reported by the media as one of the risk factors for AIDS. In this context, the growing popularity of J.O. clubs—both commercial and noncommercial venues where groups of men can enjoy mutual masturbation—can be seen as a radical and responsible answer to government attempts to control sexual behavior.

One illustration of how the scientific and political aspects of AIDS coalesce is the issue of human T-lymphotropic virus (HTLV-3) or lymphadenopathy associated virus (LAV), the putative cause of AIDS according to segments of the U.S. and French medical-research establishments. The mainstream media, ever ready to simplify the unwieldy truth, played a large part in making HTLV-3/LAV the AIDS virus. This, along with the single-minded influence of Robert Gallo of the National Cancer Institute, has had the effect of embargoing research into other causative agents.

Patton notes, "The wildly careening 'AIDS virus' breakthrough dwarfed its detractors and other research that pointed in different or more cautious directions." Yet she fails to recognize the work of researchers like Jane Teas and John Beldekas on the possible link between AIDS and African Swine Fever. Reports in the *New York Native* and medical journals that provide evidence of a government cover-up by the U.S. Department of Agriculture and Centers for Disease Control of the AIDS-Swine Fever link deserve to be examined carefully.

Patton's two-chapter diversion into the phenomenon she calls "erotophobia"—in which AIDS is mentioned barely eight or ten times—is extremely inaccessible to readers not versed in modern critical theory. Any relevance to AIDS is obscured by the turgid prose.

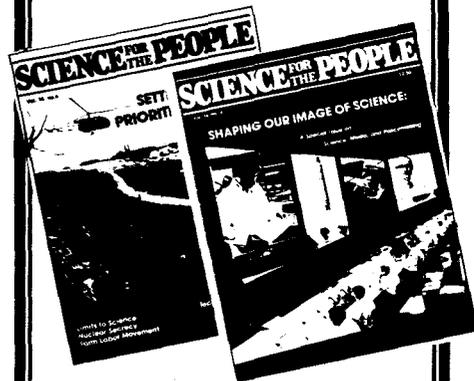
Yet one cannot disagree with Patton's conclusion. AIDS, she writes, "is double jeopardy: it endangers life through both disease and political persecution, and increases the likelihood that at-risk populations will be considered guilty (infected) until proven innocent (disease-free). No solution of the AIDS epidemic will be complete until those at risk are neither blamed for the disease nor forced to live in continued fear for their lives." I would add that we can hope to find a way of responding to the proliferation of AIDS and ARC only if the tools currently used by doctors are radically altered to reflect a broader vision of the body.

## Women, Health, and Technology Conference

The Women and Technology Project at the University of Connecticut is sponsoring a conference on October 23, 1986. Paper presenters will focus on women as they affect and are affected by technology in occupational and health care settings. Keynoters are Judy Norsigian of the Boston Women's Health Book Collective, author of *Our Bodies Ourselves*, and Evelyn Fox Keller, author of *Reflections on Gender and Science*. For registration information, contact:

**Women, Health, and Technology Conference**  
 Non-credit Programs, One Bishop Circle  
 Box U-56D, Room 128, UConn  
 Storrs, CT 06268; (203) 486-3231

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## Assessing the Nuclear Age

Edited by Len Ackland and Steven McGuire

Bulletin of the Atomic Scientists, 1986, \$12.95 paper

Last August, the Bulletin of the Atomic Scientists commemorated the 40th anniversary of the atomic bombings of Hiroshima and Nagasaki and the founding of its magazine, dedicated to the prevention of nuclear war. Most of the essays in this collection appeared in the Bulletin's 40th-anniversary issue in August 1985, and a dozen others appeared in more recent issues. Contributors to this collection range from Manhattan Project veterans to arms control analysts and nuclear weapons freeze proponents.

The essays are arranged in five sections. "Retrospectives" sets a reflective tone for the volume, with essays from scientists involved in developing the atomic bomb and nuclear technology. The articles in "Atomic Culture" provide a social and historical context to the impact of nuclear weapons on science and politics. Other essays examine Star Wars, nuclear winter, arms control, U.S.-Soviet relations, and the militarization of society. The final section, "Futures," offers different visions of survival and escape from nuclearism.

Contributors to this volume include Victor Weisskopf, Bernard Feld, Hans Bethe, Jerome Wiesner, Morton Halperin, Mary Kaldor, Randall Forsberg, and Robert Jay Lifton.

—L.F.

## Know Your Body

by Health/PAC

17 Murray St., New York, NY 10007, 1985  
Set of 8 booklets: \$6 plus \$1 postage & handling

Theoretically, our society is "information rich". But because health information may be fixed to a high physician's fee or couched in inaccessible language, it is still possible to be misinformed about a matter as intimate and vital as gynecology. Some women suffer for lack of advice.

In recognition of this problem, the nonprofit Health Policy Advisory Center (Health/PAC) has updated and reprinted an inexpensive series of pamphlets for women that explain abortion procedures, menopause, vaginal infections, breast cancer, and routine gynecological check-ups, while providing space for health resources and records. The "Know Your Body" series was originally compiled in the early 1970s by

Health Right, an independent feminist collective, and updated by Health/PAC, which plans clinic distribution in addition to individual sales of the pamphlets.

On the whole, the "Know Your Body" pamphlets are plainly written, though there are flashes of unexpected humor. "There's nothing worse than trying to scratch your vulva discreetly in a public place," the booklet entitled "Infections of the Vagina" wryly comments. In fact, with the exception of generally muddied graphics of female anatomy, this is the best pamphlet in the series—complete with inexpensive home remedies and a realistic portrait of health clinics.

The series is most effective when it provides examples of the social and economic obstacles to adequate health care. The booklet on menopause provides information and sympathy, noting that "once women are no longer able to have babies, the government loses interest in their health needs," and therefore, "around the time of menopause... good low-cost services become harder to find." This situation can be life-threatening to older women, who should be tested for reproductive cancers.

When grounded in real issues, the "Know Your Body" series reads like the advice of a learned and compassionate friend. Its distribution should be encouraged by progressive health care workers across the country.

—Holly Metz

## Going Sour Science and Politics of Acid Rain

by Roy Gould

Birkhauser Boston, 1985, \$11.95

The causes of acid rain are known and the remedy is clear: reduce emissions of sulfur dioxide and nitrogen oxides.... The technological solutions to acid rain are at hand, but the political obstacles have been formidable." Starting with these premises based on the scientific evidence, *Going Sour* gives the reader an account of the acid rain story: the double tragedy of its pollution and of society's failure to do anything about it.

The three parts of the book divide evenly into an overview, scientific causes and effects, and the scientific and legal politics of acid rain. Written in a concise style which is comprehensive and accessible to a general reader, Gould discusses the ecological effects of acid rain on lakes, streams, soil, forests, air, crops, buildings, natural and manmade materials, animals and aquatic life, as well as

respiratory effects of acidic air pollution and health effects from the toxic metals leached into drinking water.

Gould's in-depth explanation of the political obstacles to dealing with acid rain make *Going Sour* an insightful work. After highlighting the major antagonists in the drama to prevent the implementation of solutions—the electric utilities, coal industry, the Reagan administration, and a weak and compliant Congress—Gould debunks the major objections they raise. From "there is no acid rain problem" to "we don't know what causes the problem" and "we don't know which polluters are responsible for acid rain," industry and government excuses, lies, and duplicity are exposed.

As for the Environmental Protection Agency's denial of scientific evidence and its chilling effect on the scientific community, Gould states that "few scientists were willing to jeopardize their research funds by publicly criticizing the EPA's interpretation of the scientific record."

*Going Sour* concludes with an explanation of the need to implement existing legislation like the Clean Air Act and to amend laws to cover acid rain and interstate pollution. Pollution-control technologies that reduce sulfur and nitrogen oxide emissions are explained, and Gould suggests energy conservation and the use of alternative energy sources to replace or reduce reliance on fossil fuels which cause acid rain. An appendix with a list of references, a glossary, tables, figures, and photos showing the effects of acid rain complete the book.

—Joseph Regna

## The Second Sickness Contradictions of Capitalist Health Care

by Howard Waitzkin

Free Press paperback, 1986, \$11.95

Howard Waitzkin examines health care policy and practice from a Marxist perspective, and documents his arguments with wrenching personal profiles, studies, statistics, and examples. The book—now available in paperback at a more accessible price—begins with an analysis of the social contradictions which cause medical problems, how the profit motive creates illness, and why those who need it the most receive the least health care.

The second section uses case examples to bring home his analysis. In his study of intensive coronary care units, Waitzkin

shows how an expensive technology was created by corporations, the U.S. government, and the medical community, which resulted in billions of dollars of corporate profits without scientific evidence of its effectiveness over ward treatment or less expensive interventions.

In the chapter "Social Medicine and the Community," Waitzkin analyzes the growth of private medical care and its impact on public hospitals and community medicine. While public spending on health care has increased, most of that money has gone to private hospitals and research, and many public facilities have been cut back or closed. Even with Medicaid and Medicare, service for poor and low-to-middle-income people has declined, since poorer communities and uninsured people have fewer public hospitals and clinics available to them.

The last section of the book presents options for social change in health care policy and delivery. Waitzkin advocates a national health service, changes in doctor-patient relations, and medical-political activism as strategies to weed out the social roots of illness. Let's hope that many health workers will use his book as an organizing manual.

—LF

## Suncell

### Energy, Economy & Photovoltaics

by Christopher C. Swan

Sierra Club Books, 1986, \$17.95 cloth

Christopher Swan calls photovoltaic cells (PVs) the main course in a dinner of renewable energy resources: their use would complement other renewable technologies and practically eliminate the need for nuclear energy and fossil fuels in a few decades.

A shift to PVs would affect international economies and industries, and help to demilitarize societies who would no longer need to protect and fight over oil and other nonrenewable resources. Environmental destruction and hazards—such as acid rain, toxic waste, pollution, and radioactive nuclear waste—would become history. Furthermore, Swan believes that the development of photovoltaics could bring about a transition to a decentralized, accessible, environmentally clean, inexhaustible, cheap, and more democratic energy system.

These are sizable dreams, but the biggest utilities in the U.S. aren't ready to abandon nuclear, oil, and coal power. Reagan's government continues to subsidize and support the nuclear

industry and acid rain producers. Swan's book explores the political and economic factors that have stalled development of photovoltaic technology.

Suncell also provides an in-depth explanation of how photovoltaics work—their history and technology, examples of the latest innovations in research and industry in the U.S. and other countries, and the global development of PV markets.

—LF

## Sexism and the War System

by Betty A. Reardon

Teachers College Press, Columbia University, 1985, \$10.95 paper

Drawing on feminist and peace literature for her analysis, Betty Reardon examines the fundamental relationship between sexism and militarism, exploring



the common social and psychological structures that lead to all forms of violence—from battering and raping women to exploitation of the Third World and the threat of nuclear annihilation.

Reardon shows how women's issues, long neglected in the male-dominated field of peace and military research, are inextricably linked to the goals of the peace movement, and she calls for an integration of feminist theory and peace research. She concludes that transformation to a disarmed and demilitarized world depends on the global adoption of feminist values, and the convergence of feminism and the peace movement are necessary to get us there.

—LF

## Co-op America Alternative Catalog

by Co-op America

2100 M St., NW, Suite 310, Washington, DC 20063, 1986, \$1

Here's a wonderful way to support progressive groups and businesses. The products offered in Co-op America's biannual catalog are produced by socially and environmentally responsible organizations who practice "a spirit of cooperation in their workplaces." The quality is good, prices are lower than most commercial outlets, and your money will support the work of family, women and worker-owned business, cooperatives, and nonprofit organizations.

"This catalog links socially responsible producers with the consumers who want to support alternative economic enterprises," states Co-op America's director, Paul Freundlich. Hundreds of products from around the globe are offered in this catalog.

Groups like Pueblo to People, Pan Tropic Hats, Cooperative Trading, and One-World Trading import food, clothing, and furniture from cooperatives in Central America, Africa, and the Caribbean. Coffee drinkers can support Nicaraguan and Tanzanian coffee growers. Women's and third world music are available from Redwood Records and Ladyslipper.

There's also lots to read: self-help law books from Nolo Press, children's books from Parenting Press, and subscriptions to many alternative periodicals. Co-op America also offers an alternative health insurance plan, a socially responsible investment kit, and "Making Changes", a packet of information about cooperative workplaces and community-based careers.

# AAAS IN 1986

## Counting Technology's Costs

BY SETH SHULMAN

**“W**e live in a society on death row, under indeterminate sentence of death by nuclear war.” So began Kenneth Boulding, professor emeritus at the University of Colorado in his keynote address at this spring’s annual meeting of the American Academy for the Advancement of Science (AAAS), held the last week of May in Philadelphia. “The situation is in considerable part a product of the world scientific community,” continued Boulding, former president of AAAS, “and that community cannot escape responsibility for it.”

Boulding’s unusually dire tenor may have surprised a few attendees, but even more astonishing than Boulding’s remarks was the frequency with which similar concerns were expressed throughout this year’s 152nd annual meeting of AAAS. In fact, social concerns and broadranging questions about the costs of technology were so commonplace at the AAAS meeting they seemed to set the tone of the entire event. In seminars and general discussions throughout the week-long meeting, panelists conveyed a somber sense about the state of the world and the role scientists have played in its development in recent years.

How times change. It was exactly a decade ago that AAAS broke seven years of confrontation by finally giving official recognition to Science for the People’s workshops on topics concerned with the political implications of science and technology. At the time, one newspaper journalist had termed the acceptance of Science for the People’s perspective into the regularly scheduled events “an unlikely turn of events.”

For seven years prior to 1976, as many SftPers may remember, Science for the People struggled to get AAAS to include workshops and discussions at their annual meeting about the political implications of science, the costs of technology, and the effects of the military

*Seth Shulman attended the AAS annual meeting with the MIT Bush Fellows science writing program. He is former editor of Science for the People.*

on the scientific community. This year, these issues were all prominent at the meeting, even overshadowing some of the talks about recent advances in different fields. And while the analysis was sometimes not as incisive as it might have been, the social and political implications of science and technology were paramount on people’s minds.

Of course, a major reason for the extent of questioning and handwringing this year is the spate of technological disasters that have occurred around the world recently. Two of the best attended sessions at this year’s meeting were special additions to the schedule: one on the space shuttle Challenger’s explosion and the other on the meltdown at Chernobyl. But these were hardly the only sessions to focus on the underside of technology. Other half-day sessions addressed such somber topics as the public health implications of the Union

For seven years, Science for the People struggled to get AAAS to include workshops on the political implications of science & the costs of technology.

This year, these issues were all prominent at the meeting.

Carbide explosion in Bhopal, India, and a seven-year retrospective on the health and ecological effects of the nuclear accident at Three Mile Island.

But to attribute the extent of discussion of technology’s costs at this year’s meeting solely to the recent technological disasters would be a mistake. Rather, I believe, the prevalent tone of so many of the talks at the AAAS meeting this year marks the culmination of a multitude of gradual changes that have crept into the consciousness of the public and the mainstream scientific community.

To be sure, there were still many sessions that didn’t share this type of perspective, like “Moving Industry into Space” or “Chemistry is Fun and Fruitful,” but these were certainly in the minority. Notable were sessions like “Science and Apartheid” and a heavily attended session on “Gender Bias in Scientific Studies.” To a surprising degree, it seems, a more critical, “Science for the People perspective” has been incorporated by those looking at the development of science and technology. But to what extent?

**A**t three different sessions over the course of the week, I heard panelists use the same phrase when they caught themselves making unusually harsh critiques of the path a specific technology had taken. One of these was a panelist who spoke at a session about the impact of biotechnology on agriculture. Decrying the displacement of so many farmers in the U.S., perhaps he felt he was sounding a little too anti-technology. “I’m not a Luddite,” this speaker began, “but we do have a problem in the way this specific technology is—and isn’t—being implemented.”

A similar phrase was echoed by a member of the panel on the effects of Three Mile Island who wanted to make it clear to a questioner that he was not against technology *per se*. “I’m not a Luddite,” he said, “but the management of a dangerous technology like nuclear power is an issue that should concern us all.”

Particularly interesting about these examples is the fact that the speakers were

delivering such damning critiques of current technologies at all. Also notable is these speakers' hesitation to take their critiques "too far;" despite the tremendous amount of discussion about the costs of specific technologies, I heard few remarks about the larger framework that these technologies operate within. Most speakers were loathe to make the types of connections between issues that Science for the People has championed so successfully over the years.

Before elaborating briefly on how we might foster discussion of some of these connections in meetings and public forums, I would like to provide a few more examples that indicate how much counting of technology's costs is going on lately. For instance, this year's Westinghouse science journalism awards (given annually at the meeting by AAAS) went overwhelmingly to "cost counting" articles. In the magazine category, the winning article was about nuclear winter, and in the small circulation newspaper category, two articles about water pollution tied for the prize.

Only the week before the meeting, *U.S. News and World Report* ran a banner cover story entitled "High Tech Anxiety." Look at the way the piece began: "Technology was supposed to

solve problems, not cause them. To free mankind, not hurt the innocent. But in the span of a few months, the dark side of technology has asserted itself."

In light of the long struggle by Science for the People and other organizations to get AAAS and the general scientific community to acknowledge the non-neutrality of science and to take more seriously the social costs of technology, the pervasive mood at the 1986 meeting and the attitude expressed by the mainstream media (as represented in the *U.S. News* article quoted above) are particularly noteworthy and instructive.

As Science for the People plans its key issues for the future, it is imperative that the organization recognize the extent of the change that has taken place in the broader scientific community in the past decade and the shorter-term changes that have occurred even in the past year or two. But it is also important to see what still hasn't changed.

Realizing that technology will not magically solve all of society's problems—that it provides problems, too—is and has always been only part of SftP's message. Although many AAAS sessions this year paid heed to the costs of technological development, the scientific community, at least as represented by the AAAS meeting, seems to be floundering for a

vision of what should be done—especially in light of the awesome responsibility for the state of the world that they hold. And it is here that SftP is particularly needed in the debate.

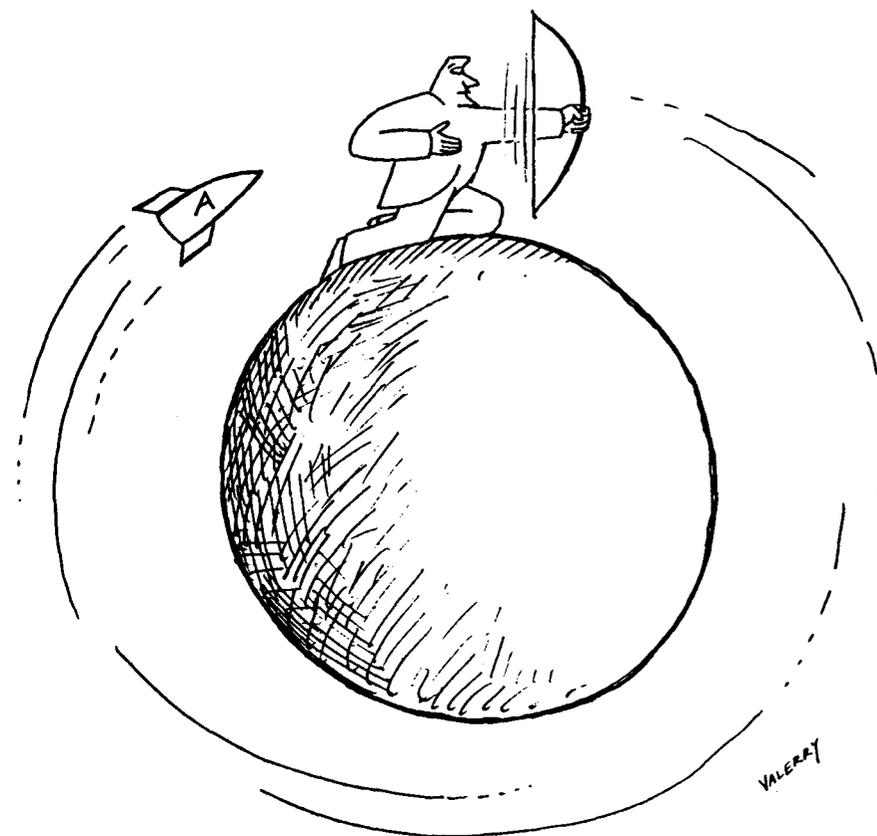
Specifically, SftP needs to continue and increase the discussion, in these pages and elsewhere, of what is driving our technologies. Rather than focusing, as the mainstream media does, on the specific mechanisms that led to a technological disaster like the space shuttle explosion (although these are important questions), Science for the People takes a different tack. SftP's strength comes from addressing society's reliance on dysfunctioning technological systems in the first place, and in looking at how technologies might be developed to more closely serve human needs.

Key issues that need to be raised include discussion of the socioeconomic systems that lead to centralized, potentially dangerous technology like nuclear power, as well as the search for alternatives. In the case of the Bhopal disaster, as was pointed out in the November/December issue of the magazine, this includes an investigation of our excessive reliance on pesticides, fertilizers and synthetic chemicals of all sorts.

Equally important, questions must be raised about the growing militarization of society and the way in which that directs technological development. Currently 70% of our tax dollars for federally sponsored R&D go toward military projects. With the current administration attempting to divert academic scientists in peacetime to work on a Star Wars program which dwarfs even the Manhattan project in proposed funding, the increasing military involvement in academia needs particular attention. And the military is not the only force currently pressuring academia. Questions need to be raised, too, about the appropriate role of corporate involvement in an independent academic environment.

In short, rather than the limited critiques of specific technologies, we need to help to develop a language for evaluating and saying no (if need be) to new developments, and a vision of the future that will help us to know when that's necessary. The time is ripe to bring these perspectives more visibly to forums like the AAAS meeting, where people are already especially conscious of some of technology's costs.

We hope we won't need Ned Ludd and his army of machine smashers to raise these types of questions. But then again, when it comes to turning swords into plowshares, maybe they could help.



CONTINUED FROM PAGE 3

weakened this dogma. Now the reverse translation step, from protein back to nucleic acid, would seem to refute it entirely and reinstate the idea, held by Lamarck, Erasmus, and Charles Darwin, of some mechanism of environmental adaptational input as the source of genetic regulation, difference, and change.

What does it matter? Lots! The accepted view of genetic regulation, for almost a century, has excluded such cause-and-effect environmental influence, in line with the Weissmann concept of an autonomous, sequestered genome, conserving traits stabilized by noninteraction with extra-nuclear events. Only random, spontaneous mutation touched this genome of official genetics doctrine, in what has been a carry-over into the 20th century of the old pre-Evolution-Theory resistance to the idea of mutability and perfectability.

Random change is as good as no change at all, in the hope for an improvable humanity—and no help at all in countering such “genetic blame” theories as eugenics and sociobiology, whose reactionary force depends upon rigid, stable genetic divisions within humanity. Rather have such theories been accommodated by this official genetics scenario of an autonomous Weissmann genome issuing genetic orders down the one-way Watson-Crick pathway, changeless except by acts of chance.

These new discoveries, therefore, bear an inherently progressive social implication, I believe, in reinserting causation into genetic regulation through these reverse mechanisms that bring environment back into the picture. It is not by chance that the reverse transcription and translation of Temin (co-discoverer of reverse transcriptase) and Haseltine work. It is not chance that Dr. Barbara McClintock evokes when positing new species formation resulting from the effect of environmental shock on her “transposable elements” within the genome (*Science*, 226:792, 1984). It is, rather, old-fashioned scientific cause and effect equilibrating genetic stasis and change, environment and heredity through some as yet unknown, but *not random*, regulatory mechanism.

As such, these are happy developments, bringing genetics into the position to counter, rather than inadvertently support, political

reaction—a cause for celebration. All that remains lacking, for the party to begin, is some sportsmanlike acknowledgment from the genetics establishment of the earth-shaking implications of these developments (or an explanation of how they’re wrong), an admission of the Central Dogma’s demise, and an apology to Lamarck’s defamed ghost. Science, justice, and history await.

—Lorraine Roth  
Brookline, Massachusetts

## Postcards for Peace

Dear SftP:

**W**ith this letter, we announce the launching of Operation Postcards for Peace. And we invite those of your readers who are as fed up as we are with militarism and the consequent waste of human, natural, and financial resources to join us.

1) STOP wasting our tax money on more nuclear bombs and other weapons! We already have more than enough. So do the Soviets. Both we and the Soviets have shown the “resolve” necessary to “build a defense second to none.” Neither is any more secure as a result.

2) START applying the same “resolve” to a joint search with the Soviets for a civilized, non-military resolution of our differences! We demand something bolder than the wary, stop-and-start poker game of the arms control experts in Geneva. We demand that our president and Mr. Gorbachev convene the best minds in both countries in all fields of expertise into a joint session with instructions *to remain in conference for as long as it takes* to draw up a blueprint for peace and a Marshall Plan for the Planet!

Millions of handwritten postcards, individually worded, mailed regularly on the first of every month, arriving at the doorstep of the president by the truckload: that is our goal. Simple, personal, and effective. The president will hear. He will get the message that millions of Americans will no longer stand for this \$800 million-a-day waste of human and material resources on an arms binge while the social, economic, and environmental foundations of our society’s health and security are allowed to go to rot.

—Bogos (Paul) Torikian  
Francois Leydet  
Forest Knolls, California

CONTINUED FROM PAGE 25

To be a leading scientist or administrator requires the kind of commitment to profession which most societies have associated with males. Qualities such as self-confidence, aggressiveness, and the willingness to be “married to a job” are what’s expected of men and, generally, discouraged in women. Having the right academic and social credentials also helps, and serves to exclude women and minorities. Thus, the central administration of science tends to be drawn from a particular segment of society.

We are not claiming that, as a result of this, other segments of society are not allowed to *do* science. Important first steps, such as some recruiting of women and minorities and some “blind refereeing” of papers, have occurred. Nevertheless, women, minorities, and even white males with “non-mainstream” ideas tend to remain at the periphery of the scientific community, working at less prestigious institutions, getting fewer grants, and having their works receive less attention.

Thus, it is the expectations and limitations which society imposes on certain of its classes, and not scientific methodology itself, that is the most important determining factor in who sets scientific policy. Furthermore, if you’re a scientist working for the defense department and you have serious reservations about weapons research, you don’t have too many options—you obviously don’t belong: what did you expect?

It is possible that women do view the world differently from men, and that they do ask different questions. If they do good science, in the sense that they observe correct scientific methodology, they have every right to expect their work to be evaluated fairly. Nevertheless, as pointed out above, they stand a good chance of being ignored in spite of high-quality work. It would seem that we, as scientists, can prevent this by changing the social conditions which select for the current group of scientific decision makers.

A society which stresses each person’s responsibility for the welfare of his or her fellows, which makes sharing a virtue, and which forces accountability for the consequences of one’s actions will produce the kind of citizens to whom we would care to entrust the direction of science. Certainly, producing such a society within the framework of American capitalism is a formidable task. Politically, the times are indeed very inauspicious, though things may change or be changed. In any case, those of us who are teachers, writers, or parents have a particular opportunity to advance this cause by constant public and private reaffirmation of our ideals.





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Volunteer as a maternal child nursing instructor. Fluent Spanish and labor and delivery experience required. A minimum of one month commitment is necessary. Write or call:

#### The Maternal Child Health Project

513 Valencia Street #6  
San Francisco, CA 94110  
(415) 481-7760

### War Relief for Nicaraguans

A campaign to raise money to aid victims of the U.S.-sponsored contra war. Money is used for medical care, construction of rehabilitation facilities, personal aid for families, orphans of Nicaraguan soldiers and civilian victims, and recreation for soldiers. All money is sent directly to the Nicaraguan Commission to Support Soldiers and Their Families, and donors may designate the activities they want their contributions to support. Mail contributions to:

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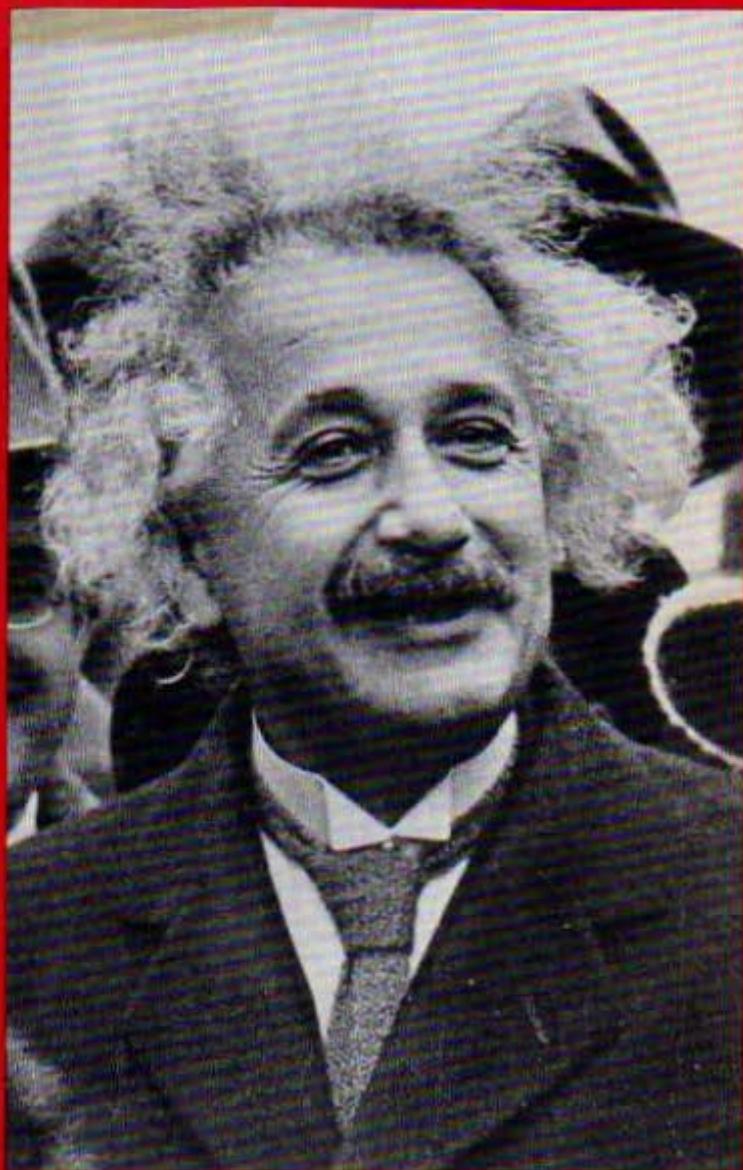
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