

AZI: Your Money or Your Life • Microwaves versus Hope

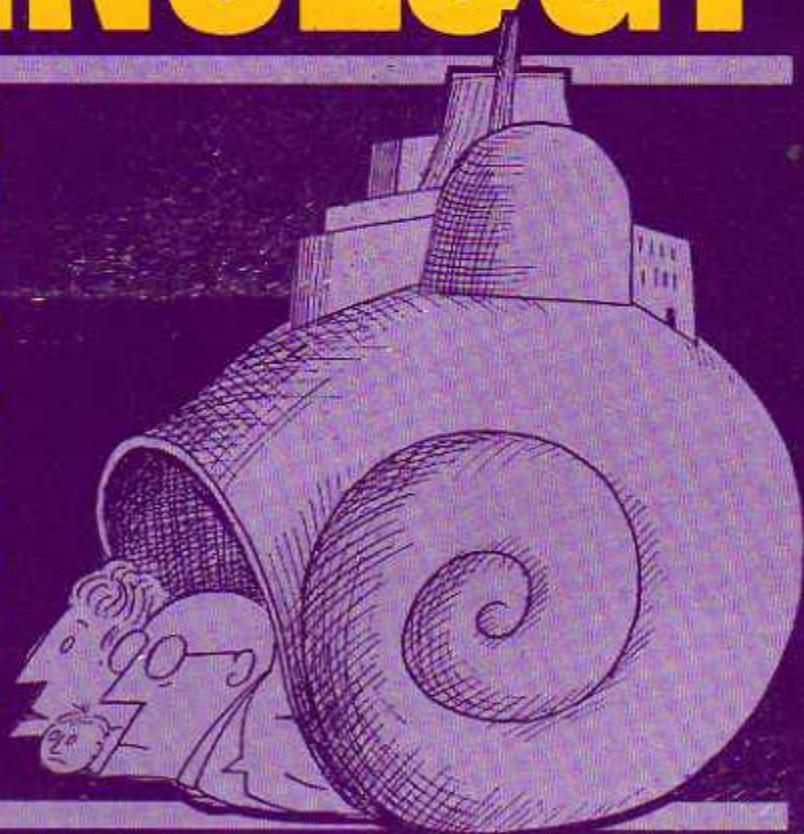
SCIENCE FOR THE PEOPLE

Vol. 19 No. 5

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CHOOSING TECHNOLOGY

LOOKING
OUT FOR
PUBLIC
INTEREST



DAVID DICKSON • RUTH HUBBARD • PHILIP BEREANO • JONATHAN BECKWITH

READERS WRITE BACK

Thanks to all of you who responded to our reader survey earlier this year. Comments and questionnaires are still trickling in, and those of you who haven't sent in a piece of your mind are still invited to do so.

Most of those who responded have been reading SftP for less than three years—41 percent. But 22 percent have been with us for three to five years, and 20 percent have read the magazine for five to ten years. What surprised us was the relatively high ratio of double-digit readers: 16 percent have stuck with us for over ten years.

Fifty-three percent are men, 44 percent are women, and the rest didn't tell us. Most are between 25 and 40 years old—56 percent—and 27 percent are between 41 and 65. The 18-to-24-year-olds and over-65 respondents are evenly divided at eight percent each. Two-thirds have graduate degrees, which surprised us too.

Newsnotes and In Brief reviews and resources are most popular with our survey respondents. More than half read those sections in every issue. Eighty-five percent often or always read SftP's feature stories. Longer reviews, letters, opinions, and grassroots reports are usually read by more than sixty percent.

Our coverage of topics and mix of articles seems about right to most readers. More than half of the respondents are satisfied with SftP's reporting about the environment, agriculture, occupational health, high tech, biotechnology, science and the military, the Third World, nuclear power, and nuclear weapons. A third of the respondents recommended more coverage of the Third World and of medicine and health care, and 42 percent would like more articles on women and science. We didn't expect requests for more articles about the philosophy and history of science, though, which 54 percent asked for. We hope that the articles by David Dickson and Diane Paul, along with the forum of scientists' responses to new technologies in this issue, help to satisfy those desires.

Should SftP orient itself more to academics and science professionals, or should it become more of a general-audience magazine? That's a question we hoped this reader survey would help answer, but the responses were evenly divided. According to one reader, "SftP can either try to become more popular, albeit for a left audience, or more of a tool to organize left scientists to be more activist. I think it should do the latter." Another writes, "You are my only connection to the world of science. I become more and more interested as I read." We will continue to use our national organization, newsletter, and committees to work with scientists, and try to address both scientists and nonscientists more effectively through the magazine.

More than three-quarters of the respondents agreed that SftP teaches them something about science and that they gain political insights from the magazine. Those are goals we're sure of, and it's good to hear that we're meeting them.

SCIENCE FOR THE PEOPLE

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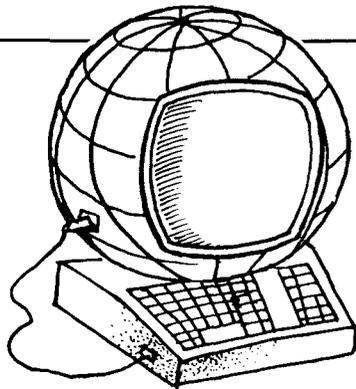
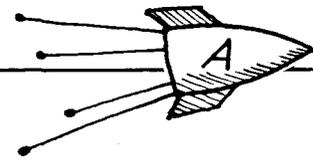
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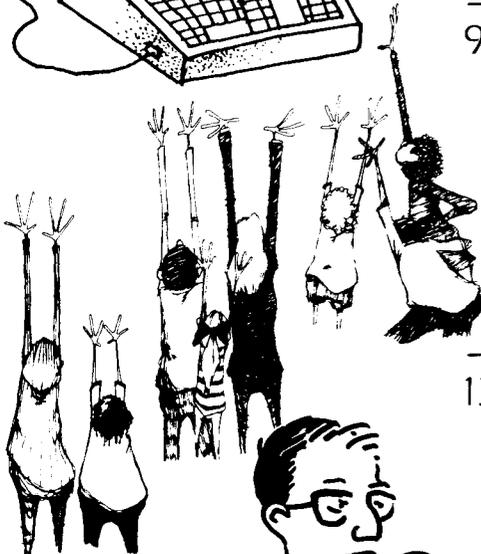
by David Dickson

Access to scientific knowledge has become central to any debate over establishing public interest criteria for technology. Research and development programs are not chosen on the basis of equity or social need. Rather, they are justified as being necessary to meet economic and military security.

9 RESPONDING TO TECHNOLOGIES

by Philip Bereano, Ruth Hubbard & Jonathan Beckwith

The debate over choosing appropriate responses to new technologies continues. Philip Bereano examines technology and social relations. Ruth Hubbard maintains that debates over research priorities and new technologies are framed to purposefully exclude public participation. Jonathan Beckwith questions the rigid application of science-is-politics analyses and antitechnology attitudes in some progressive responses to new technologies.



13 AZT: YOUR MONEY OR YOUR LIFE

by Tim Kingston

Cornering the market on drug treatments for AIDS, the manufacturers of AZT are selling one of the costliest prescription drugs around for about \$10,000 a year. The history of AZT is also a case study of the profit motive behind pharmaceutical research and development.

17 THE NATURE-NURTURE CONTROVERSY

by Diane B. Paul

One of the most frequent claims in the lengthy history of the nature-nurture debate has been that it is over. But the corpse of this particular controversy will not stay buried. Recent reports of its demise are still premature.

21 MICROWAVES VERSUS HOPE

by Joseph Regna

At the U.S. Air Force Base in Greenham Common, England, cruise missiles have been deployed in "dispersal exercises" since 1984. Feminist opposition to these nuclear war preparations has been met with exposure to microwave radiation around the military base.

DEPARTMENTS

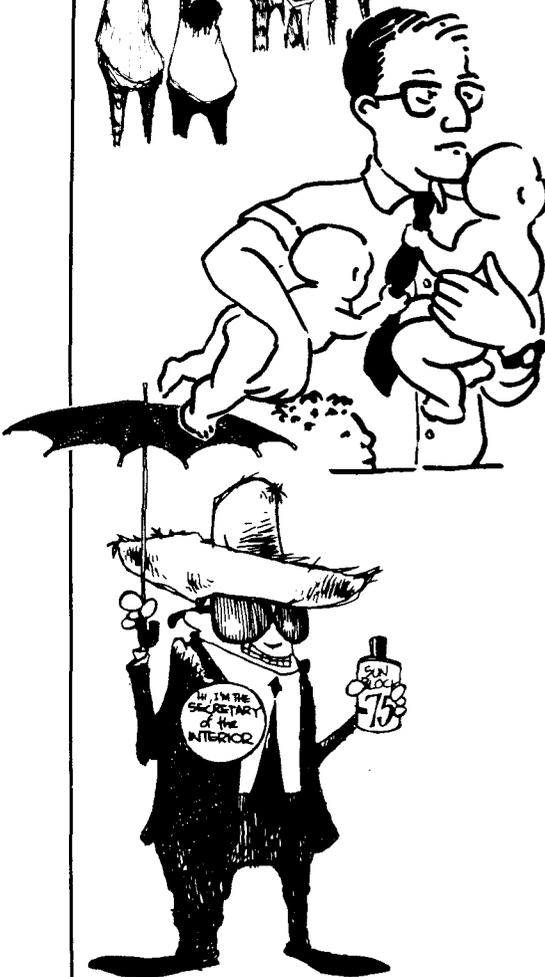
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TOXIC DISCRIMINATION

If you are black or Hispanic, you are more likely than a white person to live near a toxic waste dump. That is the conclusion of a report released in April by the United Church of Christ's Commission on Racial Justice.

The commission found that more than 15 million of the country's 26 million blacks live in communities with at least one uncontrolled toxic waste site. A similar situation exists for more than eight million of the nation's 15 million Hispanics. As the number of dumps in a community increases to two or more, so does the minority population. Moreover, three of the five biggest hazardous waste landfills in the U.S. are located in communities that are predominantly black or Hispanic.

That the location of these sites is the result merely of chance is "virtually impossible," according to the study group. In many cases, they found that siting a hazardous waste facility was linked to promises of jobs and contracts to minority-owned businesses. Given the high rates of poverty and unemployment in minority communities, the economic lure comes as no surprise. Indeed, the commission found that depressed economic conditions, a lack of education, and the daily struggle for survival left minorities particularly vulnerable to such high-risk enterprises.

"These communities cannot afford the luxury of being primarily concerned about the quality of their environment when confronted by a plethora of pressing problems related to their day-to-day survival," said the Rev. Benjamin F. Chavis, Jr., Executive Director of the commission. But the health risks posed by these sites is a special concern to the commission, given recent evidence that blacks and Hispanics are showing high rates of cancer, heart disease, and birth defects.

The commission charged that both the government and the environmental movement have been unresponsive to environmental issues affecting minorities. Accordingly, the group urged that federal agencies be required to consider the impact of environmental policies on racial and ethnic groups and that a special office within the EPA be created to address minority concerns. Grassroots organizing by community groups and churches specifically around environmental issues is also advocated.

—Tracey Cohen



John Klossner

FAKE FAT

Imagine being able to have your cake and actually eat it too. In a society virtually obsessed with food and dieting, such a prospect should bring on absolute delirium. Aspartame and saccharine have gone a long way toward this end. But artificial sweeteners might soon pale in comparison to a new food substitute developed by Proctor & Gamble: fake fat.

Called olestra, this synthetic fat is made of ordinary table sugar bonded to a string of fatty acids. Sounding more like a new wash-n-wear polyester than a dietary aid, olestra has some highly desirable (i.e., marketable) properties. It tastes and smells like the real thing, and it has that all-important buttery mouth appeal. But unlike real fat, olestra has no calories. Nor is it converted into artery-clogging cholesterol. In fact, it passes through the body undigested. The molecule has even been found to reduce the body's absorption of cholesterol from fatty foods.

Few things in life come without complications, however, and olestra is no exception. Some people given the compound have experienced stomach upset and diarrhea. Low dosages, according to one source, might alleviate the problem, assuming that consumption is carefully monitored.

Judging from the application submitted by Proctor & Gamble to the Food and Drug Administration, however, monitoring is likely to be left to the individual consumer. And dosages of this fake food won't be low, either. The company has asked the FDA for permission to market olestra as a replacement for up to 75 percent of the oils used commercially in shortening, deep-frying oil, and salted snacks. Proctor & Gamble also wants to replace 35 percent of the fat in home cooking oil with its synthetic. Eventually, olestra may turn up in everything from mayonnaise to ice cream.

Obviously, people with serious cardiac, vascular, or metabolic problems might benefit greatly from reduced dietary fat and serum cholesterol. Too much fat probably made them sick in the first place. While the medical significance of fake fat has not gone unnoticed, many doctors have reserved judgment about olestra, pending further trials. Still, ending the American love affair with deep-fried foods and greasy snacks would do more for good health than yet another biotechnological fix.

Ironically, as some people vacillate between fitness and obesity, an estimated 20 million Americans—more than half of them children—are suffering from hunger and malnutrition. Apparently, feeding these people is not as lucrative as the market in low-calorie potato chips.

—Tracey Cohen

STUDENTS PLEDGE RESPONSIBILITY

Today's young people are often accused of being materialistic and self-centered. But many members of the Class of 1987 at Humboldt State University in northern California have proved otherwise by signing a voluntary graduation pledge of social and environmental responsibility in employment.

The pledge, one of the first of its kind, is intended to help create an atmosphere where social and environmental responsibility is openly discussed and plays a more central role in life decisions. Students were handed copies of the pledge after receiving their diplomas at the May 16 Commencement ceremonies in Arcata, California. The text reads: "I pledge to thoroughly investigate and take into account the social and environmental consequences of any job I consider."

"The pledge statement is kind of what education is all about," said Mark Murray, former HSU student body president. "We become educated men and women so we can go on and act in a socially and environmentally responsible

manner." Murray thinks the pledge "is a reminder for us. It's not what the education is and what it can do for you—it's what you can for society with that education."

Graduate Michele Van Hentenryck decided not to interview with San Francisco-based Bechtel Corporation after considering the pledge and inquiring into Bechtel's activities. "I didn't like that they work with the weapons industry and that they're not very open about their dealings. Maybe I'm just one person," she added, "but who knows? If everyone acts as role models, it could have an effect."

Organizers of the Humboldt pledge drive included Student Citizens for Social Responsibility, Students for Progressive Action, members of the student government, and the local chapter of Physicians for Social Responsibility. After a ballot initiative won student approval, the pledge proposition won unanimous endorsement by the faculty senate and support from university administrators. Arcata's city council passed a resolution praising the pledge-signing option and urging the university to make this a part of future graduation activities.

"This is part of a growing awareness that our individual actions have an impact on the world," claimed Bill Ihne, a 1987 graduate and member of Student Citizens for Social Responsibility at Humboldt. Ihne, who plans to help spread the pledge idea, said, "We want it to be a catalyst for other schools around the nation and the world."

For more information, write to pledge organizer Matt Nicodemus at 968 F St., Arcata, CA 95521.

SCIENCE IN THE STREETS OF INDIA

The All-India Science Festival will take science on the road to the villages of India this October. Sponsored by 26 People's Science Organizations and hundreds of scientists, the festival will proceed across more than 15,000 miles to bring science education to rural Indians.

The festival will begin in five different towns, with busloads of participants scheduled to visit 500 locations. The People's Science Organizations plan to use a multimedia approach, bringing roadside theater, songs, films, quizzes, exhibits, and competitions to Indian communities. Organizers say that the festival seeks to "forge active grass-root linkages between scientists and the people at large who are presently alienated from science." Since more than 80 percent of Indians live in rural villages and do not see the impacts of modern science and technology, festival organizers hope to reach millions of those people with science news.

The festival march will end in Bhopal on November 7 with a day-long "science Woodstock." One thousand scientists and 5,000 teachers plan to join the People's Science Organizations in Bhopal, almost three years after the gas leak at Union Carbide's pesticide plant there killed or injured thousands of Indian citizens.

—information from *Nature*

MISSING SOMETHING?

Several readers have contacted us to complain of missing centerfold pages in their July/August issues. We apologize for this printing error, and have no idea how many of our subscribers were affected by this problem. Please contact us if you're missing pages and would like a replacement copy of that issue.



HATS OFF TO HODEL

In recent years, there has been a trend toward blaming workers and those who dare to go outdoors for their occupational and environmental illnesses. Workers are told that shop floor injuries

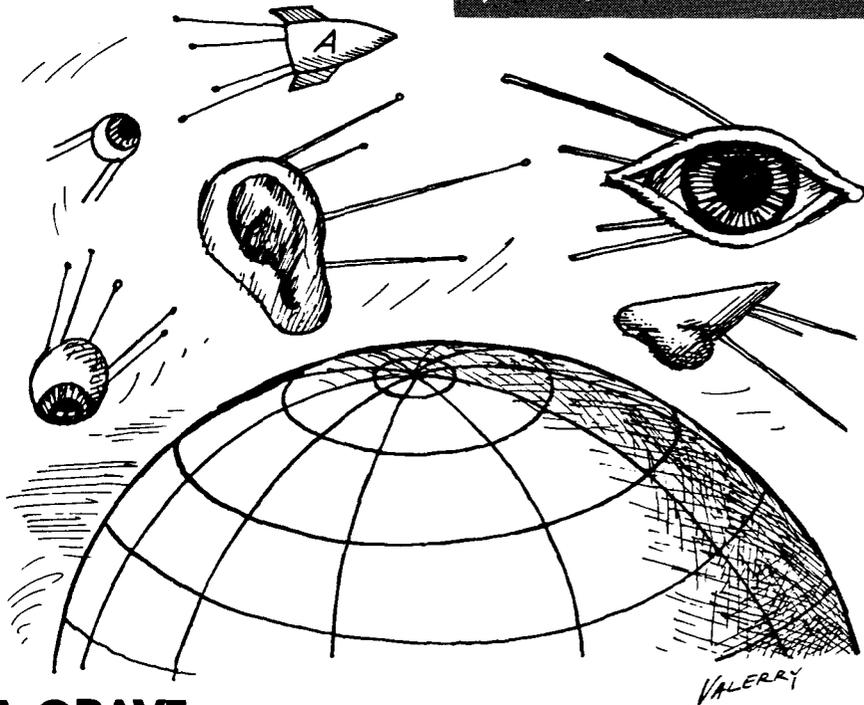
are their fault; neighbors of toxic dumps are told that elevated cancer rates are attributable solely to smoking and other lifestyle factors.

But one Reagan administration official went too far when he suggested that the way to stem a projected epidemic of skin cancer caused by depletion of the atmospheric ozone layer was not an international treaty to reduce emissions of chlorofluorocarbons—to slow down the destruction of the ozone—but a new type of personal protective gear.

In June, the U.S. Senate voted 80-2 to reject Interior Secretary Donald Hodel's plan to urge people to wear sunglasses and straw hats to counter depletion of the ozone layer and protect themselves from the sun's rays. This summer, President Reagan, recovering from an operation to remove cancerous skin tissue from his nose, advised Americans to keep out of the sun. But the Senate resolution rejected "suggestions that simple changes in lifestyle can offset these adverse health and environmental effects of ozone depletion."

Straw hat manufacturers expressed disappointment with the Senate vote, and Coppertone shelved plans for a Hodel line of sunscreens.

—Stephanie Pollack



A GRAVE PROBLEM IN SPACE

Astronomers from the University of Illinois Urbana-Champaign are fighting a Florida company's plans to turn outer space into a graveyard for more than just space debris.

The scientists wrote Transportation Secretary Elizabeth Dole and expressed their opposition to the Celestis Group's proposal to launch the cremated remains—called “cremains”—of up to 10,000 people in orbiting mausoleums. The astronomers complained about the hazards to spacecraft and astronauts posed by the growing amount of space

debris. They're also concerned about the adverse effects on astronomic observations caused by “light pollution” from the space caskets.

If the scientists can't defeat Celestis's proposal, the lawyers may. The state of Florida first tried—unsuccessfully—to define the mausoleums as a cemetery, which under Florida law would require the company to have at least 15 acres of land and a paved road, and to put \$25,000 into a maintenance fund for each plot. When that gambit failed, the state insurance commissioner notified the company that they may be charged with operating a funeral home without a license.

Celestis's plans are currently on hold.
—Stephanie Pollack

EFFECTS OF VDTs NOT IN THE NEWS

The health effects of electromagnetic radiation from video display terminals are in the news again—or at least they should be.

New experimental results from Uppsala, Sweden have received even less press attention than a similar study done last year at the Karolinska Institute in Stockholm. Both studies found that VDT-type radiation can upset fetal development in mice.

In the more recent study, Professor Gunnar Walinder and his coworkers at the Swedish University of Agriculture Sciences in Uppsala exposed pregnant mice to weak pulsed magnetic fields and compared the outcomes to controls. They found a significant increase in fetal deaths and fetal loss among the exposed mice. The offspring of the exposed animals also had a higher incidence of malformations, although this finding was not statistically significant.

The new study adds credibility to claims that VDT radiation presents a risk to pregnant women, according to *VDT News*. These claims have been received skeptically in the U.S., however, and have received almost no press attention. The American Medical Association has stated that there is no evidence of VDT radiation risks for pregnant women. The Environmental Protection Agency is no longer doing any research on nonionizing radiation. The Food and Drug Administration has only a small research program. No U.S. labs are attempting to repeat the Swedish mice experiments, largely due to the dearth of research funds.

—information from *VDT News*

SMOKERS FIGHT BACK

Philip Morris, Inc., producer of Marlboro cigarettes and other toxins, has a slick new magazine, *Philip Morris*, which does its bit to battle the Surgeon General's campaign for a smoke-free society by the year 2000.

Philip Morris features articles on sports, food, and local color. What do maple syrup and the America's Cup have to do with cigarettes? These articles show sporty, rugged all-American smokers having fun and keeping up with nonsmokers in the race toward health and happiness. It's a magazine full of false advertising for smoking. *Philip Morris*

tries to persuade its readers that they can have it all—play hard, smoke hard, and never be plagued by emphysema, lung cancer, or other smoking-related illnesses.

But the big issue for *Philip Morris* is “smokers' rights.” In addition to the tobacco lobby's tired claim that a link between cigarettes and lung cancer is still unproven, there is a new and similar theme—secondhand smoke won't hurt you either! To that end, *Philip Morris* is applauding the Department of Transportation's postponement of a ban on smoking during domestic airline flights.

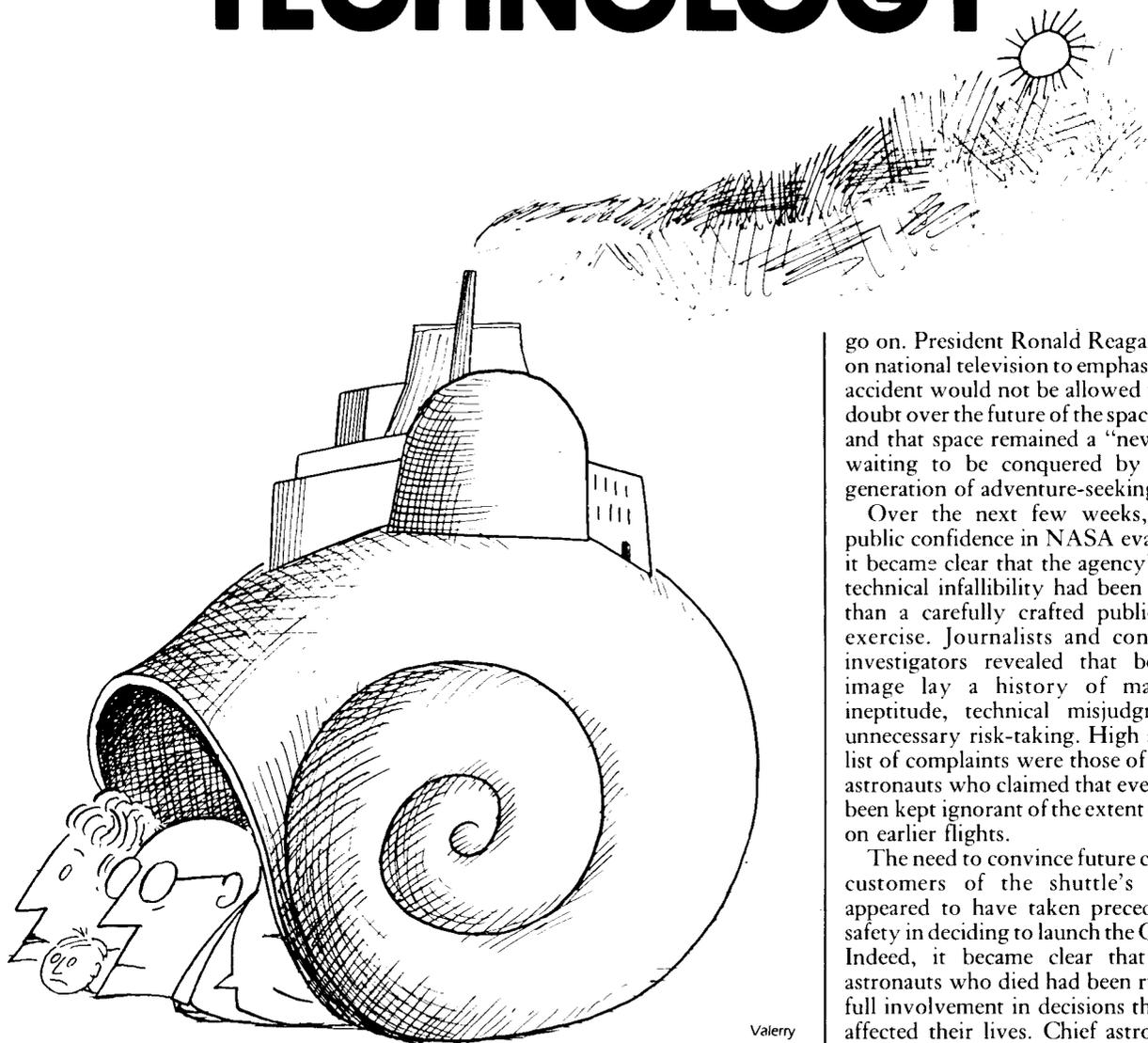
Freud would have had a good time with the author of the editorial “I'm too Understanding to Mind.” Although she'd quit smoking “for no particular

reason,” this masochist goes out of her way to inhale other people's smoke, begging smokers to blow it in her face. “My husband will never end his affair with cigarettes,” she writes. “He's devoted to them as deeply and sincerely as he's committed to me. I don't mind.”

As a committed smoker's antidote to the American Cancer Society's “Great American Smokeout” campaign to help people quit, Philip Morris offers a “Great American Smoker” kit to ward off those offensive nonsmokers. And because the tobacco industry has so much money to burn, subscriptions to *Philip Morris* are free and massively distributed. We saw our first issue at the local public library.

—Ellen Weinstock

CHOOSING TECHNOLOGY



Valery

BY DAVID DICKSON

When the space shuttle Challenger exploded in flames shortly after takeoff on January 28, 1986, the first reaction of the U.S. administration was to insist that the show must

David Dickson is European correspondent for Science magazine and author of The Politics of Alternative Technology. A portion of his second book, The New Politics of Science, was excerpted in the July/August 1984 issue of Science for the People. The following article was adapted from an address he delivered at the Committee for Responsible Genetics conference, Creating a Public Agenda for Biotechnology, on November 13, 1986.

Public Interest Criteria

go on. President Ronald Reagan appeared on national television to emphasize that the accident would not be allowed to cast any doubt over the future of the space program, and that space remained a "new frontier" waiting to be conquered by a modern generation of adventure-seeking pioneers.

Over the next few weeks, however, public confidence in NASA evaporated as it became clear that the agency's image of technical infallibility had been little more than a carefully crafted public relations exercise. Journalists and congressional investigators revealed that behind this image lay a history of management ineptitude, technical misjudgment, and unnecessary risk-taking. High among the list of complaints were those of the shuttle astronauts who claimed that even they had been kept ignorant of the extent of the risks on earlier flights.

The need to convince future commercial customers of the shuttle's reliability appeared to have taken precedence over safety in deciding to launch the Challenger. Indeed, it became clear that even the astronauts who died had been ruled out of full involvement in decisions that directly affected their lives. Chief astronaut John Young later suggested to the disaster inquiry committee that "there is only one driving reason that such a potentially dangerous system would ever be allowed to fly: launch schedule pressure."

It was a similar story a few months later when the nuclear reactor exploded at Chernobyl in the Soviet Union. The first explanation offered by the Soviet government to Western nations, concerned about the impact of the accident on their own nuclear power programs, was that the accident was the result of "human error" in switching off emergency cooling systems while the reactor was being put through some dangerous experiments. Subsequently, blame was passed to the designers of the RBMK-type reactors for failing to build in safety systems that would have predicted such mistakes and prevented them from being made.

Both explanations were welcome in the West, which could argue that the heavy automation of its own nuclear power plants made a similar accident almost impossible. Only later did it emerge that—just as in the Challenger accident—a key factor that had led those in charge of the reactor to continue the fatal experiments, even with all the danger signals flashing violently in the control room, was pressure to maintain a strict work schedule. If the experiments had not been carried out that night, they would have had to wait a year before they could be tried again, and those responsible for the delay inevitably would have been penalized.

Yet there was no discussion in public debates of the social factors that contributed to the accident. The main concern of the International Atomic Energy Agency in Vienna, for example, has been to argue that the accident should not be seen as an indictment of the principle of obtaining electricity from nuclear power, which, in the words of IAEA director general Hans Blix, “has passed the point of no return.”

The implications of the Challenger and the Chernobyl disasters go far beyond the dangers of space exploration and nuclear power respectively. We live in a world where we are continually being told that high technology will provide not only for all our material needs, but for many of our cultural (and even spiritual) ones as well. It may officially be acknowledged that technology has its dangerous aspects, hence the existence of safety devices that range from seatbelts in cars to detailed regulations for the disposal of radioactive waste.

But we are encouraged to leave decisions about what is safe and what is dangerous in the hands of technical experts, and the control of our lives in the hands of the machines and regulations that they design. Where there are risks, we are told, we can be certain that they will be outweighed by the benefits.

So successful has the marketing of this message been that a desire to stand in the way of technological progress, indeed even to raise questions about the direction in which it is leading, has become the major heresy of the late twentieth century. If we probe behind the facade of technological optimism and euphoria, however, a different picture emerges. The uncertainties surrounding the risks of technological projects, as tragically demonstrated by the Challenger accident, are often far greater than they are portrayed.

Technical experts themselves often disagree on the precise nature of specific technology-related threats, such as the health damage caused by low-level radiation, or the implications of a steady buildup of carbon dioxide in the atmosphere. In some cases, new technologies can have totally unexpected consequences, such as the pregnancy drug Bendectin that was

later discovered to cause vaginal cancer in the daughters of those to whom it had been prescribed. In others, typified by the testing of genetically altered microorganisms in the environment, new technological practices may be introduced before their full potential risks are known.

If there is a common theme running through these different examples, it is the way that a mask of technical certainty and confidence is used to deflect questioning, particularly that which may become sufficiently intense to throw doubts on the way that decisions have been made. A seamless web is thrown over technological decisions to make them appear part of a grand design.

If we raise questions about the need for a new space station, we are merely told, in the words of former NASA administrator James Beggs, that it is the “next logical step” in the U.S. space program. Little mention is made of the powerful aerospace companies who have lobbied hard for the space station in the face of skepticism from the industrial, military, and scientific communities similar to that which greeted the first proposals for the shuttle as the cheap way into space.

If we question the continued desirability of nuclear power, we are given statistics on how much “cheaper” or “cleaner” it is than coal, not on the military value of sustained nuclear power programs. If we criticize the hasty and frequently uncritical way that new production techniques have been introduced into traditional industries, we receive the short response that “you can’t stop progress.”

Time and again we find a purely technological logic used to disguise the commercial and political interests that lie behind all technological decisions, even down to the level of research priorities. The very pervasiveness of this process is significant. The consequence of living in an advanced industrialized society is that technology touches all aspects of our daily lives. But it also means that technology in some form is used to further the interests of virtually every social group, including, in particular, major industrial corporations and the military community.

Decisions about the directions in which technology should develop therefore lie at the intersection of the desires and motivations of a number of actors which can have widely differing goals and motivations. And in any conflicts, the views of the most powerful will, inevitably, tend to dominate.

Recent years have seen a growing number of problems arising from technologies developed to meet commercial or military criteria alone. These make it increasingly important to establish public interest criteria for the development of new technologies.

We have now reached a point in which virtually every technological decision has

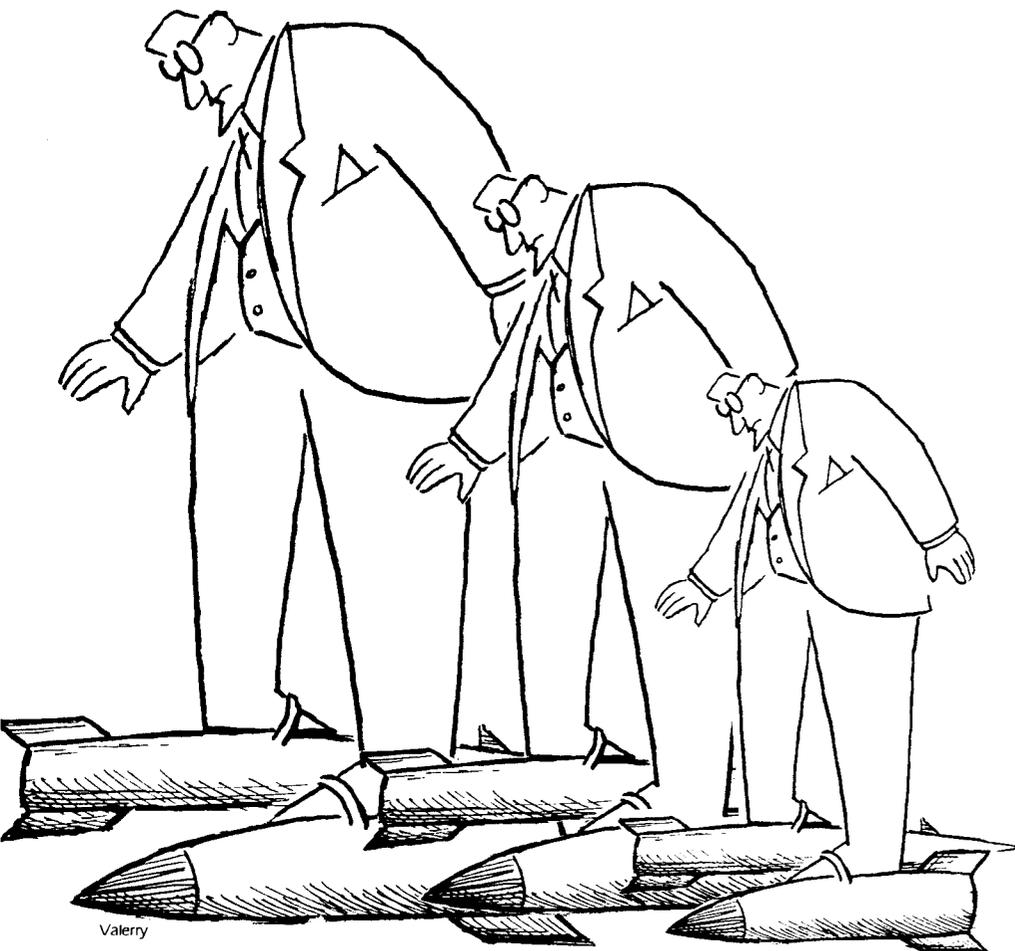
political implications and, conversely, almost every political issue has a technological dimension. In this new situation, it is increasingly difficult to separate the technical from the political.

A major research project, ranging from the Strategic Defense Initiative program to European cooperation in high energy physics, can be launched as much for political as scientific purposes. Conversely, a new technology such as microelectronics or biotechnology can immediately give rise to political issues, such as the tension between state and private control over the results of research paid for out of public funds.

As both states and the private sector have come to realize that scientific knowledge is now one of the key access routes to new technology, so they have begun to extend their influence over what is supposed to be the unrestricted field of basic science. Governments have begun to look closely at the motivations of foreign research workers attending scientific conferences. Companies have sought to strengthen their links with university research departments. And both have pursued extensions of the patent system over areas of science—such as molecular biology—not merely because a patent has a commercial value, but because it provides a legal handle on a new discovery that allows the owner to lay down the terms and conditions under which it can be used.

A new politics of science has emerged as a direct product of broader political movements around advanced technology, and particularly around recent developments in microelectronics and biotechnology research. For since scientific knowledge provides the key to these new technologies, control over and access to this scientific knowledge therefore becomes an important goal for any group which seeks the power that these technologies can convey. It is therefore not surprising that this question of access has been highly contested in many recent debates about the social control of science and technology. Some of the key questions which have come to dominate these debates include:

- Should the industrial sponsors of university research be allowed to influence the conditions under which the results of the research are published, or given exclusive rights to any patents that result?
- Should the military be permitted to prevent the publication of unclassified research which it has paid for, or to choose which foreign nationals should be allowed to take part in the research?
- Should government agencies be allowed to prevent foreign scientists from attending scientific conferences?
- Should the patent system be revised so that control of patents awarded for publicly funded research is given to the institutions which carried out the research,



rather than the public which paid for it?

- Will European countries who participate in the construction of the planned space station be able to benefit from all the research that is involved, or only that which they have contributed?
- Will those who carry out research projects for the Strategic Defense Initiative be allowed to use the results of that research for their own projects?
- Under what conditions should Third World countries be given access to scientific results produced in key areas of strategic research?

In each case, the questions of the terms and conditions of access to scientific knowledge is one of the key points at issue. This question has therefore become central to any debate over establishing public interest criteria for technology. Indeed, we find that a new form of political discourse has been erected around the way that technological research priorities are identified, one that tends to exclude such public interest criteria. Research and development programs are not decided or presented in terms of equity or social need. Rather, they are justified as being necessary to meet two external threats: one economic—the threat of international competition—and the other military.

Supporting this strategy are two ideas which have become articles of faith for both conservative and social democratic governments alike: the “high-technology imperative,” which says that if anything

can be done with high technology, then it should be done; and the “high-technology fix,” which says that for every problem technology causes in the modern world, “high technology” can guarantee to find an appropriate solution. Together, these two ideas create a mind-set that blindly erects a revitalized banner of progress, the *idée fixe* of the new political discourse around science and technology.

The Enlightenment idea that rapid technological expansion was a guaranteed route to social improvement received a severe beating in the 1970s, when science and technology took much of the blame for the ills of the modern world, ranging from the horrors of the Vietnam War to the massive destruction of the natural environment and the outbreak of new work-related diseases. But the idea of science-based progress has now crept back into fashion, and its camp followers, who include most of the scientific community as well as leaders of the industrial and military communities, have done what they can to sustain and promote it.

The social consequences of technology are not ignored in this new discourse. But they are subordinated to the broader imperative of economic and military competition. Technologies are tailored to meet social needs only to the extent that these needs can be reflected in and are compatible with demand expressed through the marketplace.

The main focus of research into the agricultural applications of genetic

engineering, for example, is on the highly profitable crops of Western farmers, not on the much wider but less profitable needs of farmers in the Third World. Similarly, safety guidelines may be introduced for new chemicals, but their levels are established by the needs of international trade.

Bodies such as the European Economic Commission in Brussels are urged to lay down Europe-wide standards in fields such as biotechnology, not primarily to protect the consumer but to preempt any one country from applying rules which are stricter than in other countries. This is a move which, as in the case of the environmental release of microorganisms, may in fact be a legitimate reflection of the political pressures which exist in one country and not in another.

In the late 1960s and early 1970s, the public reaction against the side effects of the rapid technological growth of the previous two decades resulted in various moves to democratize the process of technological decision-making. This trend can be seen most clearly in the United States. It included legislation such as the Environmental Protection Act of 1972, which gave environmentalist groups, for the first time, the legal standing to oppose major technological developments as representatives of the public interest. This response to public concern over technology's side effects was also represented in the creation of the Office of Technology Assessment in the U.S. Congress, designed to provide legislators with the technical information needed to question decisions made by the administration.

Although the trends in Europe were less marked, the public inquiries into the nuclear industry's plans at Britain's Windscale or West Germany's Gorleben reactors, and the brief flourishing of the alternative technology movement, demonstrated that they pointed in the same direction.

In practice, any development aimed at giving the public greater political control over decision-making was heavily circumscribed. Traditional power groups were allowed to write the rules under which the new power-sharing procedures were supposed to operate. And this meant that they were able to ensure that the impact of challenges to their authority was kept to a minimum. This can be seen clearly, for example, in the history of the National Institutes of Health's Recombinant DNA Advisory Committee, given responsibility for laying down safety guidelines for all publicly funded genetic engineering research.

Nevertheless, there was still a significant shift in the center of gravity of control over decision-making toward public institutions. And this shift was responsible for incorporating a growing social agenda into debates about new technologies, determining

not merely which should be accepted and which rejected, but also the principles (from a ban on disposable bottles to the safety requirements for nuclear power stations) according to which future technologies should be designed.

The trends are now beginning to point in the opposite direction. The more the private sector realizes that its strategic interests lie in keeping firm control of technological developments, the more it will work to exclude any dissemination of this control. One tactic, for example, has been to support international regulation—for example, over genetic engineering techniques—precisely in order to remove decision-making on such issues from local communities. Another has been to significantly reduce the opportunities for public debate on new technological developments by arguing that these are essential to meet economic or military competition from the outside.

How does all this relate to public interest criteria for technology? I would like to suggest the following list of criteria that should be used in developing any new technological systems and technology policies:

- The technology should be based on social need, and not be determined by either pressure for private profit or for the development of the technology for its own sake.
- It should in principle be peace-oriented rather than war-oriented. This is a more difficult criterion than it might appear, embracing as it does the question of whether a strategy of defensive technology can be considered aggressive (as in the case of Star Wars) or nonaggressive (as in the case of several new ideas currently being developed in Europe). Nevertheless, the idea that a technology should not be primarily determined by the needs of the military remains central.
- The technology should be job-creating—frequently, although not necessarily, means that it should be labor intensive—rather than job-destroying and capital intensive.
- It should be a technology which is satisfying and self-fulfilling to work with, rather than one which the individual finds either personally alienating or socially fragmenting.
- The technology should be one which distributes decision-making power as widely as possible in the community, rather than concentrating it in the hands of a narrow elite or powerful sectional interests.
- The technology must help to increase the power of women over their lives, rather than concentrate this power in the hands of men.
- In national terms, the technology must be one which encourages regional equality, rather than reproducing social and

economic disparities between one region and another.

• At the same time, the technology must help to enhance regional identity, rather than destroy this identity by reducing it to a single, national norm.



• In ecological terms—those in which the alternative technology movements of the early 1970s first learned to express their demands—the technology must encourage a harmonious relationship between humans and the natural environment, rather than require a relationship of exploitation.

• This means that the technology must be resource conserving, in the broadest sense, rather than resource intensive.

• In the same way, the technology or technical systems must be energy conserving rather than energy intensive. This is not merely a question of energy resources. As the German Greens, among others, have been pointing out, the forms of energy required to meet the needs of an energy-intensive technology (and I am thinking in particular of nuclear technology) also tend to offend several of the other criteria already listed above.

• The technology must not have a long-term destructive effect on the global ecosystem, a criterion which could be grouped with that requiring environmental harmony, but seen from a slightly different perspective.

• Finally, three criteria which will help ensure that technology meets the needs of the Third World. First, it must make maximum use of indigenous resources—including capital and labor resources—rather than import these resources from the outside. The technology must not strengthen the political power of domestic

elites, but must, as in the developed world, help to spread decision-making throughout the community. Thirdly, the technology must help to reduce rather than accentuate the gap between the rich and the poor countries, between the haves and the have-nots, between the North and the South.

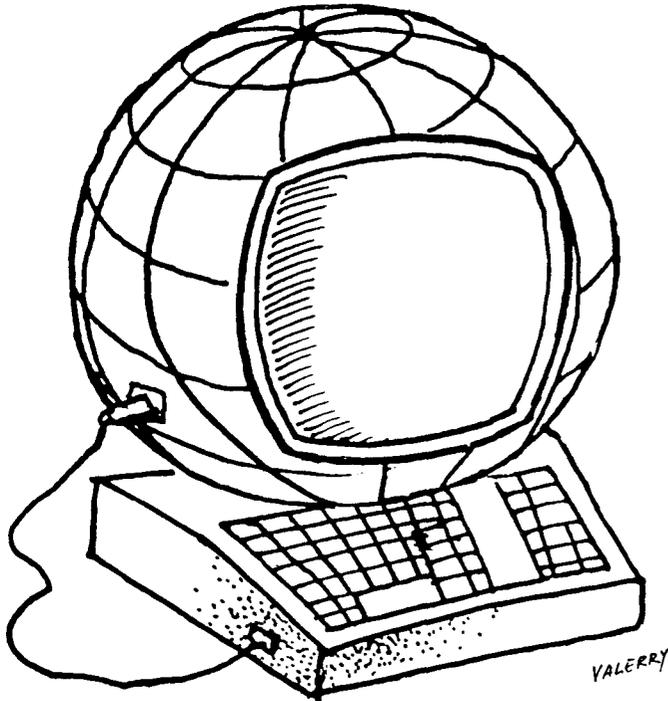
I would be the first to agree that this list of criteria for new technologies and new technical systems is highly utopian—not in the sense of being unrealistic, but in representing a long-term goal to be aimed for, rather than something which can be reached overnight. It is not intended to be any type of instant recipe, even though one can think of many technologies which already fill several of these criteria.

The main point that I want to end with, however, is that as public interest groups develop their strategies for the late 1980s and early 1990s, they must become aware of the way in which almost all of the public interest criteria listed above are being broken in one way or another by advanced technologies currently being developed solely in the name of private profit or military power. These technologies tend to be job destroying, alienating to work with, and exploitative of the natural environment. They also tend to concentrate power in the hands of the dominant classes in society—including industrial and military elites—while removing it from women, from minority groups of all kinds, and from any attempt at community-based decision-making.

Furthermore, these technologies often actively encourage social divisions within communities, within and between regions, and between nations. Finally, not only do they drive the wedge in further between the rich and the poor nations of the world, but they also increase the power of elites within these countries and disregard the real, basic needs of large parts of the population.

In developing a public interest agenda for technology over the next few years, we must do what we can to ensure that the various criteria I have described are integrated into any strategy for technological development leading to real social progress, whether at the community, regional, national, or international level.

But we must also remain aware of the powerful political interests that remain opposed to any such strategy for a socially based technology, since this cuts directly across the economic and political goals of those representing those interests. What this means is that any strategy to incorporate public interest criteria into new technologies must be a political strategy that is prepared to confront these narrow interests and eventually supersede them. It will not be an easy task. But ensuring the proper social control of technology is essential for the future of humanity, if not for its very survival. 🌱



TECHNOLOGY AND SOCIAL RELATIONS



The following forum continues the discussion of progressive scientists' responses to new technologies. Jon Beckwith started the debate with his opinion, "New Analysis for New Technologies," in the May/June 1986 issue. That analysis elicited several letters to *SftP* and John Vandermeer's response in the March/April 1987 issue. Help us keep the debate rolling with your own analysis.

BY PHILIP L. BEREANO

It has been seventeen years since I first began teaching about technology and society at the university level. The science for the people movement, and this publication, are of comparable duration. In this interim, both the popular and scholarly literature exploring the social relations of technology have increased enormously. The essays by Jon Beckwith and John Vandermeer have provided the field with a valuable service by setting out a topology of the various authors' viewpoints: technocratic, use-abuse model, technology as a manifestation of class politics, and the "greening" opposition to new technologies.

As an earlier article of mine, "Technology and Human Freedom," (*SftP*, November/December 1984) should make clear, I am in agreement with Vandermeer's opinion and the contribution by Ruth Hubbard in this issue—technological endeavors usually express existing power relationships in a

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society. Even before my views on this issue had completely matured, I edited an anthology of writings on this question, *Technology as a Social and Political Phenomenon*.

In order to demystify the initiation and development of technologies, we must see them as firmly anchored in the social and political milieu in which they are called into being. Because of my commitment to democratic values, I believe that people must understand this close connection if they are ever to be able to develop more authentic and autonomous lives.

The Vietnam era certainly offered lessons which refute the technocratic viewpoint. Social movements which have developed since that time incorporate important analyses which reject this once-dominant view that technology is neutral, value-free, and available to all.

The antinuclear movement now understands that the basis for funding solar and other alternative energy systems instead of nuclear power depends, for example, on whether Carter or Reagan is in the White House. The women's movement has explored how "math anxiety" and other social stereotypes have contributed to the continuing disempowerment of women by perpetuating an extreme state of technological illiteracy. And the movement to control nuclear armaments has come to realize that the continued stockpiling of nuclear weapons does not depend on any rational analysis of "security" needs, but instead relates to vested economic interests and power relations on the part of certain corporations and a macho ideology held by

industrial leaders and military officials.

At the other extreme, the total oppositionist point of view (perhaps best exemplified by its earliest exposition in Jacques Ellul's *The Technological Society*) has proved itself ineffective and fairly irrelevant to bringing about significant social change. True, less extreme variants of this position—in particular, works by Theodore Roszak and Ivan Illich, which have helped us to understand the reductionist danger in technological activities—have produced a general "greening" and an important renewed contemporary awareness of the role of spiritual, moral, aesthetic, and transcendental aspects in human activity and existence.

The choice of which model is therefore more "correct"—in the sense of helping us to understand our situation and to create a social theory which will enable us to bring about social change of the type we favor—is between the use-abuse and technology-is-politics models. Beckwith comes down in favor of the former, and Vandermeer the latter.

To me, the flaw in the use-abuse model is its failure to focus sufficient attention on *how new technological phenomena come into being*. It invites an analysis which asks, given a particular technology (which, by the way, it tends to narrowly define in terms of hardware alone), what are the potential impacts? And what are the consequences of utilizing this technology in whatever formats may be possible under prevailing political and social norms? Certainly, the raising of such questions is an advance over the previously dominant

technocratic model, which served only to pacify people by insisting that there were very few, if any, variations possible in the formatting of technological hardware and that the consequences had to be accepted.

Historically, the use-abuse model grew up in the 1960s, when the externalities associated with environmental pollution and some assaults on personal dignity and integrity became popular political issues. The use-abuse viewpoint has been espoused by the dominant corporate liberal ideology because it suggests that some improvements are possible through reforms—enacting pollution-control regulations, using tax subsidies or fiscal incentives to get businesses and municipalities to run their wastes through treatment plants, and so forth. And analyzing the social impacts of a technological application, through a process such as technology assessment, can be important for professionals and community groups alike.

However, technologies are not acts of God, Nature, or History. Technological and social factors exist in a dialectical relationship, affecting each other. The use-abuse model inherently deflects our attention away from the equally compelling question of how social, economic, and political factors in a culture lead to the development of particular technological hardware (see David Dickson's *The Politics of Alternative Technology*).

Thus the use-abuse model perpetuates our disempowerment by distracting our attentions and energies from what may be the most fruitful lines of inquiry and community activity. It leads us to examine only patchwork modifications when more thorough reexamination (that is, radical: "to the roots") may be required. For example, the problems of nuclear power plants cannot be cured by assuring better evacuation plans for adjacent citizens; reactors are inherent manifestations of a nondemocratic concentration of decision-making authority and economic power.

If we are concerned that democratic values be present in all aspects of our lives, then we must understand that the generation of electricity from nuclear power is incompatible with a democracy (whether it be in the United States or in Cuba) because it requires, in fact, both a centralized economy and hierarchical politics. The writings of Murray Bookchin (for example, *Toward an Ecological Society* or *Post-Scarcity Anarchism*) make this point with telling force.

By being thus nonholistic, the use-abuse model reinforces the dangerous intellectual limitations of reductionism. In the field of biotechnology, which Beckwith refers to, it has led to the regulatory position that the

deletion of a gene from an otherwise benign microorganism can never lead to any negative consequences. Such reductionism ignores the interactions between any species and its environment, a more holistic view which enables us to understand that the deletion of a gene and the proteins it may produce could alter the ability of the organism to survive in an ecological niche, leading to considerable environmental perturbation.

But in a more practical sense, if we accept the political model of technology rather than the apolitical use-abuse viewpoint, we are better able to analyze and confront the issues of resource allocation. The origination and development of technologies surely correlates with the availability of resources for important research, field tests and trials, and other stages in the diffusion of a technology. In other words, we need to analyze on the macroeconomic level as well as the micro level in order to explore technological alternatives.

If we only focus on the impacts which flow from a technological development, we are less likely to be able to analyze successfully how the allocation of resources affects the very existence of other technological possibilities (or, indeed, nontechnological means of dealing with problems). As a result, we see the dominant forces in this society insist that the solution to world hunger lies with yet more biological and agricultural technologies, rather than land reform. We learn about

ever more sophisticated technologies to provide infertile couples with biological children, when we live in a society which has a scandalous mortality rate among infants who have already been born. And we witness this society relentlessly pursuing the automation of work processes, despite the consequence of increasing work degradation.

Who is making the decisions in these situations? Are hungry Third World peasants pushing for more insecticides? Are bereaved families in city ghettos and on Indian reservations urging us to perfect *in vitro* fertilization? Are secretaries in insurance companies the ones advocating the development of computer work stations?

Progressives must realize that the use-abuse approach is inadequate because it largely accepts the definition of reality laid down by existing powers. Our politics teaches us that we must refuse to accept such imposed realities. Women must stop being defined by men, Jews by gentiles, blacks by whites, and gays by straights. If we look at the history of totalitarianism, we see that the most effective way to keep a people oppressed is to get them to internalize their own oppression. This is why the cry "Black is beautiful" was so profoundly threatening to the political establishment twenty years ago—and why saying "technology is politics" is so threatening to them today.

LEFT OUT OF THE NEW TECHNOLOGY DEBATE

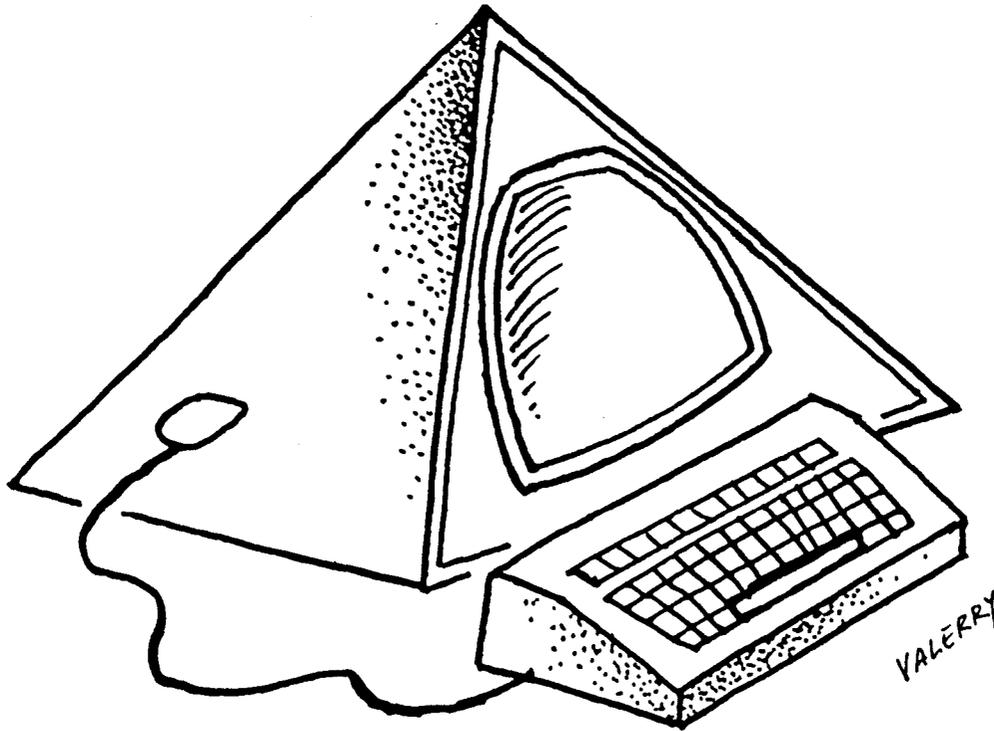
BY RUTH HUBBARD

While I basically agree with John Vandermeer's opinion piece in the March/April 1987 issue, I want to comment further on Jon Beckwith's "New Analysis for New Technology" in

Ruth Hubbard teaches biology and women's studies at Harvard University. She is a member of Science for the People and its editorial advisory board, and serves on the Executive Council of the Committee for Responsible Genetics.

the May/June 1986 issue, which he published to invite discussion. Beckwith argues that by voicing concern, "Science for the People made an important contribution to the (early) debate over biotechnology," but events have shown that we were wrong to urge caution now that "biotechnology has become a major technology in the world, with significant potential for improving the welfare of people."

He cites two examples: the (as yet unrealized) attempt to develop vaccines that could be useful against parasitic



diseases and diseases of livestock “which are important for many developing countries,” and new methods of genetic screening being worked out in Argentina to make it possible to trace the children of people who have been “disappeared” by the military and unite them with their grandparents.

I disagree with Beckwith’s description of what happened with biotechnology and find his examples unconvincing. Beckwith confuses two levels at which decisions about science and technology are being made. One is the societal level, where organizations like Science for the People and the Committee for Responsible Genetics can play an important part by testifying before legislative committees and other policy-making organizations at local, state, and federal levels and by serving as resources for advocacy groups, journalists, and interested citizens. Here the issues are usually at least partly political and, in addition to supplying technical information, we can clarify priorities and power relationships in order to help people evaluate potential effects of the technology on different individuals, interest groups, and on society.

Then there are the debates among scientists, funding agencies, and within firms that are developing the technology. Here it is taken for granted that the science and technology will go forward. The questions asked are about the forms in which the new technology should be developed and how to market it. At this level, our organizations are not part of the

debate, not because “we have left ourselves out,” but because our insistence on taking account of the political content and impact of science and technology rules us out. “They,” not “we,” leave us out.

Take vaccines: New and more effective vaccines are wonderful in theory, but do little in the countries that need them most. In those countries, the main reason people are ill and die from parasitic diseases and other infections is not lack of vaccines, but malnutrition, too little water, and inadequate sewage disposal. Twenty-five years after the measles vaccine was introduced in rich countries, measles continues to be a major killer in the poor ones, which is where parasites and diseases of livestock are the greatest problems.

Vaccines cannot attack the power relationships under which parasitic diseases flourish; in fact, they can make them worse. Since disease and death rates in the poor countries of the so-called Third World are grounded in economic and technical dependence on the rich and capitalist countries, high-tech scientific developments are more likely to increase than decrease those rates.

That is why Cuba is trying to develop its own resources for genetic technology, so that it will not have to depend on other countries. And the technology may be of benefit there, as long as Cuba remains alert not to allow expensive technologies to erode their commitment to adequate standards of nutrition, sanitation, and health care for everyone. So, I do not accept the argument about vaccines any

more than the earlier promises of curing world hunger and cancer which Beckwith, too, dismisses.

As for tracing children of the “disappeared”, I am appalled that this is supposed to be a justification for developing a technology—screening for genetic markers—that many of us fear will be yet another way to increase differences in power between people and between nations, that further the kinds of official brutalities of which disappearances are an example. (Will these technologies be used in Chile, El Salvador, and Guatemala?)

Finally, I want to say something about prenatal screening and other reproductive technologies whose benefits Beckwith urges us not to ignore. I will confess at the outset that I believe the disproportionate interest in genetics stems not from the fact that heredity and genes are much more fascinating or important than other aspects of living organisms, but from the opportunities genetics offers for social control. From the start, these were clear to the eugenicists in the U.S., Britain, Scandinavia, and Germany, who helped put genetics on the map. Recent historical research shows that, although the Nazis were able to utilize genetics more frankly and decisively for purposes of social control, some of the most respected scientists, physicians, and politicians in other countries framed the issues surrounding genetics and social control in similar ways.

At present, in the democracies of the West, the new reproductive technologies are presented as increasing “choice” and

especially the choice to have healthy children. This is something all of us would want if we could have it, but we cannot, since health is not something we can choose, before birth or later.

Hidden behind this way of stating the situation are the economic pressures to relieve state and private agencies of the need to care for people with special needs, along with social and political pressures that are oppressive to people whose needs or demands diverge from those of the majority, and ideological pressures to believe in a wider range of individual choice than exists. The argument that new reproductive technologies increase individual choice also masks professional pressures to continue medical and legal control over childbearing, conflicting with women's

efforts to enhance our own control over our sexuality and participation in procreation and other social functions.

These issues and more would need to be included in a genuine debate about research and applications of reproductive technologies. But as the debate has been framed by the medical/technical establishment, of the issues I list, only the economic ones get brought up, and only to bewail the costs of caring for people with disabilities. This accounting usually neglects the fact that many people with disabilities would like to be economically independent and productive, and could be if employers, transportation systems, and other institutions met their needs better. Also neglected are the economic and social contributions people

with disabilities make, despite the obstacles they encounter.

These are among the issues we introduce when our kinds of organizations participate in the debate over new technologies. We have been useful and consistent with our political and scientific commitments when we inform people and help them articulate, and fight for, their needs and rights. But I believe that it is pointless to try to enter the debates that take place within the scientific/technical establishment. They exclude or obscure the issues we consider most important, because their terms are defined by the people who have the most to gain financially, professionally, and politically from developing the technologies as unencumbered as possible by public discussion and interference.

SCIENCE AND POLITICS ARE COMPLEX

BY JONATHAN BECKWITH

I am pleased that my opinion in the May/June 1986 issue has elicited controversy, but I am disappointed at many aspects of the responses. In particular, it seems to me that the reaction has been that if I criticize in any way the use of the "science is politics" approach, I must be on the other side—supporting the use-abuse model. Phil Bereano is most explicit in his characterization of my position, but other responses appear to take the same tack. To quote my original article, I suggested that the science-is-political perspective had been used "to a greater extent than warranted" to oppose development of new technologies.

In fact, I agree with much of what is said in these responses. I accept and constantly use the "science is politics" way of looking at problems of science and technology. What I suggested was that the overextensions of this approach have led to an opposition to nearly every new technology. It is important for us to examine and understand the social roots of new technologies. But the temptation to put each one into the same neat analysis holds many dangers. It

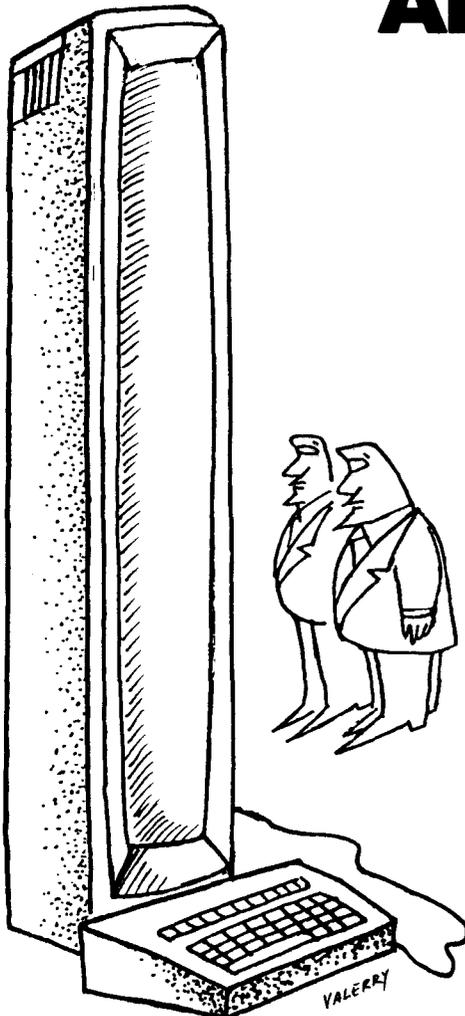
is this automatic application of a rigid analysis that I oppose. And I fear that underneath it all, this tendency stems from an antitechnology position.

John Vandermeer uses the example of tomato harvesting to show that science is inherently political and that the consequences in this society benefit the wealthy at the expense of workers and the poor. This is an excellent example. That is why I used it in my opinion to show that this type of analysis is very important! However, one ideal case study cannot be used to generalize.

There is little I disagree with in Phil Bereano's opinion, except his characterization of my position. While he raises concerns about areas such as biotechnology that I share, he does not conclude that the technology is inherently oppressive.

The concerns that caused me to write my original opinion are over the kinds of positions presented in Ruth Hubbard's response. She argues that the current interest in genetics stems from "the opportunities it offers for social control." I have written and spoken extensively on the historical example of eugenics and agree, for the most part, with Hubbard on the social origins and purposes of eugenics and the role played by scientists and physicians. (However, it should be noted that eugenics was also pushed in this country by

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Jonathan Beckwith is a genetics professor and researcher at Harvard Medical School. He is SftP's outreach coordinator and active in the Genetic Screening Study Group.

YOUR MONEY OR YOUR LIFE

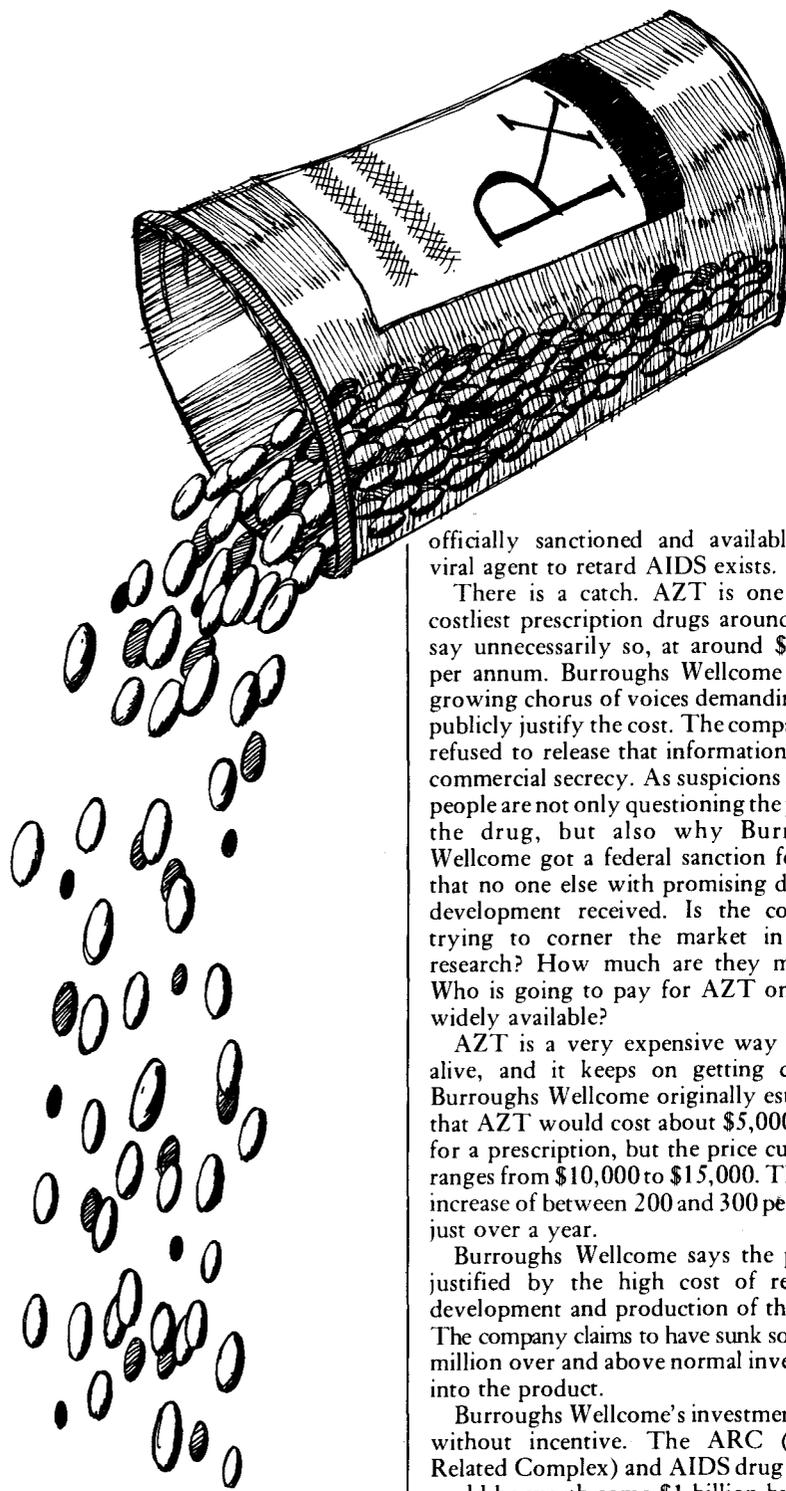
The High Cost of Living a Little Bit Longer On AZT

BY TIM KINGSTON

When Burroughs Wellcome announced the discovery that AZT inhibited the ability of Acquired Immune Deficiency Syndrome (AIDS) virus to reproduce, people breathed an almost palpable sigh of relief. At last, a licensed drug that can stave off the worst episodes of opportunistic infection, and lengthen and dramatically improve the quality of life for some people with AIDS.

AZT is not perfect, Burroughs Wellcome acknowledges. Thirty to 50 percent of the people using the drug experience bone marrow suppression, require major blood transfusions, and endure lethargy and headaches. So far, AZT can only be used against pneumocystis, a fatal opportunistic infection of the lungs. But it does work. After six long years of the epidemic, an

Tim Kingston is a staff reporter for Coming Up! newspaper in San Francisco, where a longer version of this article first appeared.



John Klossner

officially sanctioned and available anti-viral agent to retard AIDS exists.

There is a catch. AZT is one of the costliest prescription drugs around, some say unnecessarily so, at around \$10,000 per annum. Burroughs Wellcome faces a growing chorus of voices demanding they publicly justify the cost. The company has refused to release that information, citing commercial secrecy. As suspicions mount, people are not only questioning the price of the drug, but also why Burroughs Wellcome got a federal sanction for sales that no one else with promising drugs in development received. Is the company trying to corner the market in AIDS research? How much are they making? Who is going to pay for AZT once it is widely available?

AZT is a very expensive way to stay alive, and it keeps on getting costlier. Burroughs Wellcome originally estimated that AZT would cost about \$5,000 a year for a prescription, but the price currently ranges from \$10,000 to \$15,000. That's an increase of between 200 and 300 percent in just over a year.

Burroughs Wellcome says the price is justified by the high cost of research, development and production of the drug. The company claims to have sunk some \$80 million over and above normal investment into the product.

Burroughs Wellcome's investment is not without incentive. The ARC (AIDS-Related Complex) and AIDS drug market could be worth some \$1 billion by 1990, and competition is already stiff. At least 50 other companies are working on treatments for the virus that causes AIDS, called human immunodeficiency virus (HIV), in the hope of breaking into what could be the most lucrative market in the history of medicine.

In July 1985 Burroughs Wellcome got a significant jump on the competition when the Food and Drug Administration (FDA) granted AZT "orphan drug" status, a designation normally restricted to pharmaceuticals with a limited market. Orphan drug status gives the company exclusive marketing privileges for seven years, tax incentives, and, best of all, no restrictions on price. It should therefore come as no

surprise that the British-based parent of Burroughs Wellcome—Wellcome P.L.C.—has seen its shares quadruple on the London Stock Exchange over the past year.

"I think it's really important that we not put up with the pricing of AZT," says Martin Delaney, one of the co-founders of Project Inform, an information clearing house in San Francisco dealing specifically with AIDS medication and treatment. "It sends a message to drug companies that says, 'OK, this is acceptable,' and if they get away with this, the next one who comes along competing may only drop their price to nine-tenths of AZT. We want them to know the gay community cannot be exploited like this."

THE HIDDEN SUBSIDY OR, WHO'S THAT ROLLING OUT THE RED CARPET?

AZT and its nearest commercial rival, DDC, are both known as "government drugs." They were created in a government laboratory where the basic research and development was performed. When a specific use is found for the compound, or a profitable application realized, the data on the drug is turned over to a private corporation.

It is a traditional pattern in the U.S. for the state to pay for basic research and infrastructure, and for drug companies to use the assistance as a springboard for profits. In recent years the process has accelerated, with direct corporate sponsorship of universities and research institutes as the state cuts back on all nonmilitary spending.

Medicine as we know it could not exist without federal funding. Doctors get long-term loans to go to medical school that are often not repaid, medical institutions get federal grants, the NIH gives out billions of dollars in research and development, and Burroughs Wellcome gets AZT.

"This is a totally specious argument for them to behave as if this is a free market, and they came along and invented the medication," states Bill Paul of Mobilization against AIDS. "Burroughs Wellcome may have put money into a specific drug, but this idea that they have total rights to medical knowledge is utterly wrongheaded. You can bet that over the years Burroughs Wellcome has benefited from an immense social contribution."

AZT was discovered in 1964 by Dr. Jerome Horowitz at a National Cancer Institute lab in Detroit. Horowitz was hoping to use AZT as an anticancer agent, but the drug proved too toxic for use, and the patent fell into the public domain.

In 1984, Dr. Samuel Broder of the National Cancer Institute in Washington discovered AZT had promising results

against the AIDS virus in the test tube. He turned to Burroughs Wellcome and began an urgent research program to test and develop the drug. Burroughs Wellcome was granted orphan drug status and AZT was approved for clinical testing in July 1985.

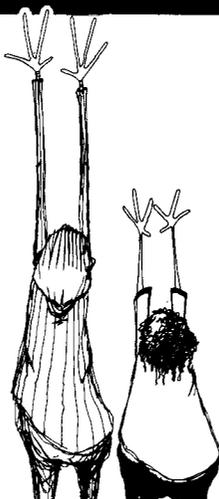
In September 1986, placebo trials were halted, because AZT was noticeably reducing mortality rates in the group receiving the drug. Only one out of 145 of the individuals in the AZT group died, while nineteen of 137 in the placebo group died. It was deemed unethical to continue placebo trials. Burroughs Wellcome then began distributing the experimental drug free to 4,500 patients through an Investigatory New Drug (IND) procedure.

AZT was approved by the FDA in only four days. "That has never happened before," says Martin Delaney. "I don't begrudge it at all, but the same red carpet treatment should apply to all the drugs being tested for AIDS."

THE BITE

On March 20 of this year, AZT was licensed for sale by the FDA in what one

"The price is not based on people's needs, but on the basis of patent monopoly. There is nothing about the production costs that should hold them back from making more of it."



observer called a "perverse advance." On the one hand, the unprecedented move makes it legally possible for anyone with AIDS to apply to the drug company for a prescription—it is the first time that an experimental drug has been officially made available to the affected population, something cancer patients have been fighting to get for decades. On the other hand, individuals wanting the drug have to figure out some way to pay for it. That includes some 4,500 people with AIDS who had been receiving the drug free in an FDA-approved IND program, in exchange for taking an experimental drug not fully tested by the FDA.

Many of those individuals thought that once on the program they would be provided with the drug free for the rest of their lives. They were wrong. Delaney says, "We should have suspected something was wrong then (when the AZT tests started), because normally when people take part in a clinical trial, the company says it will supply the drug and will continue to supply the drug, but the company made it clear they were under no obligation to provide it free of charge."

Once a pharmaceutical sales license was granted, Burroughs Wellcome gave participants in the IND program a month's supply of AZT, after which they would have to pay for the drug themselves. Kathy Bartlett, public affairs officer for the company, points out that \$10 million worth of the drug had been provided free of charge while the IND test was in operation.

In San Francisco, AZT costs \$193.64 for 100 tablets, which lasts about a month, at the Walgreens Pharmacy on 18th and Castro. At 12 doses a day, 365 days a year, that works out to \$8,481 a year, and that's one of the lowest prices in the country for the drug.

The British business magazine *The Economist* commented in its April 11, 1987 edition: "The price clearly has more to do with the temporary monopoly which Burroughs Wellcome enjoys than with research costs."

Robbi Wong, an Assistant Clinical Professor of Pharmaceuticals at San Francisco General Hospital's Ward 86, points out that the first drug in a new class is always extremely expensive. The new drug invariably has both a substantial market share advantage and a high price; Wong cited a new class of drugs used against ulcers whose price was prohibitive until a competitor entered the market. Then the price dropped sharply.

At the University of California at Berkeley, Andrew Barlow, Associate Professor of Sociology, calls the cost of AZT one of the grossest examples of monopoly pricing he has ever seen. "The price is not based on people's needs, but on the basis of patent monopoly. There is

nothing about the production costs that should hold them back from making more of it. I'm outraged. It should be stopped. The FDA has the right of reviewing pricing—even in this country it is recognized that people have a certain right to health care. Under the Reagan administration the FDA does nothing."

Dr. George Stanley of the FDA's orphan drug program in Washington denies that the FDA has the power to review drug prices once a pharmaceutical license is granted. But even he agrees: "It's the price you pay for living in a capitalist society. Once the drug is out in the marketplace, the company controls the pricing."

In New York, AIDS activist Larry Kramer accuses Burroughs Wellcome of charging AIDS patients for the cost of prior research involving AZT not directly related to AIDS. "They took a tax loss and asked us to foot the bill. All this is legal in a capitalist society, but it's shocking that they are doing this on the bodies of dying men."

PRICE FIXING

The biggest difficulty in trying to determine how the price was arrived at is getting cost estimates and data. The only people who have that information are Burroughs Wellcome, and they ain't talking. When Kathy Bartlett, public affairs officer for Burroughs Wellcome, was questioned about sales figures, the profitability of AZT, and a breakdown of exactly how the corporation arrived at the \$7,000 to \$10,000 price range for the drug, she stated, "That information is normally considered proprietary information not given out by the company. It's price-sensitive information that can have competitive value. I am not at liberty to discuss any breakdown in costs."

Even Congress has been stymied in its efforts to determine just how much Burroughs Wellcome spent on creating the drug, and what a fair price for the substance is. On March 10, after several hours of questioning, Representative Henry Waxman (D-LA) was no closer to finding out how Burroughs Wellcome had arrived at the AZT price tag than when he started. In exasperation, Waxman finally asked Burroughs Wellcome president Ted Hagler, "Why don't you just charge \$100,000 for the drug and call it a reasonable price?"

Burroughs Wellcome has its own explanation of why the drug is so expensive. Wellcome says it has sunk \$80 million into research and development costs, over and above normal capital costs for a new drug. The company argues that both the raw materials used to make the drug and the process synthesizing the compound are extremely expensive.

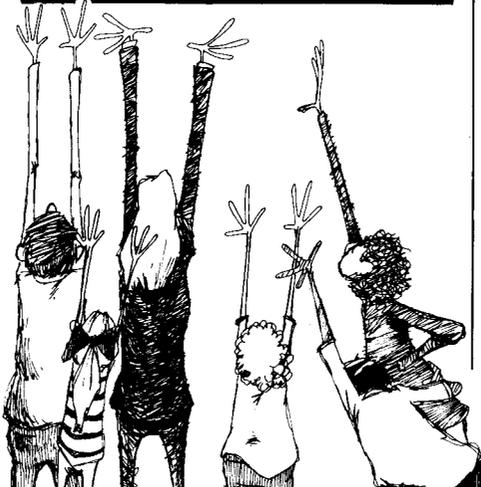
Speaking before the House Subcommittee on Health and the Environment in early March, Hagler acknowledged the high price of the drug, but said the company had looked at all the normal factors involved in pricing, including development, production, marketing, the high cost of research, what he called "the uncertainty of the market," and "profit margins customarily generated by new medicines" to determine the price of AZT.

The main ingredient in AZT is thymidine, a very rare and costly item derived from herring sperm. In 1985, world production of thymidine came to only 25 pounds. Burroughs Wellcome purchased the lot. In discussions with a senior Burroughs Wellcome sales representative, Dr. Bill Owen of Bay Area Physicians for Human Rights says he was told, "Wellcome would pay any price to get the thymidine as fast as possible," and "would be willing to pay top dollar."

Burroughs is now in the process of purchasing the world's only suppliers of synthetic thymidine and has engaged Pfizer corporation to produce it.

Kathy Bartlett complains that critics are unwilling to take into account the expense

"They took a tax loss and asked us to foot the bill. All this is legal in a capitalist society, but it's shocking that they are doing this on the bodies of dying men."



involved in the actual production of the drug, which involves at least six separate chemical reactions.

According to Hagler, Burroughs Wellcome disrupted normal production schedules and committed the majority of their research effort to the production of AZT once the drug was found effective in checking the AIDS virus.

Burroughs Wellcome officials have also included the cost of new equipment and factory space in the development costs of the drug, saying the company has to recover its capital costs. When questioned if the company was trying to pay for its investment before other competitors got into the act, Bartlett admitted, "That is a possibility," explaining, "The price is related to uncertainties in the future. We don't know how many people this drug will be appropriate for, and we do not know the status of other therapies."

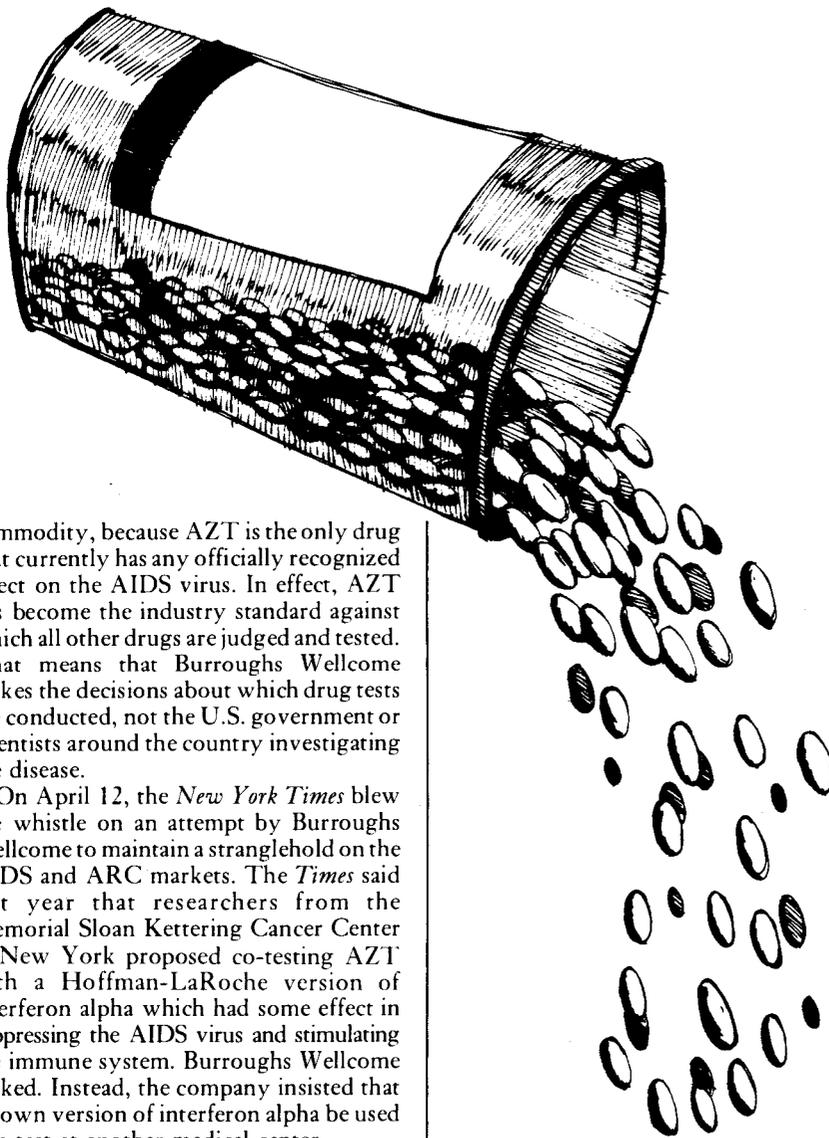
Despite the drug company's protestations, a number of individuals view the company in a distinctly dubious light. As Martin Delaney puts it, "Burroughs has refused to give out any figures on this to anybody, so pardon me for being suspicious." Delaney adds, "I think Burroughs Wellcome has been dishonest in how they have described the costs that have gone into it.... They probably realize that a year from now AZT will not be the industry standard. I think they are very interested in getting all their money back as soon as possible while the sun shines on them, because the sun won't shine forever."

DRUG WARS

AZT has been very good business for Burroughs Wellcome. The British parent company's shares have jumped from around \$2.45 before the announcement that AZT could be used against AIDS, to a high point of between \$6.75 and \$8.50 a share this year. Wellcome P.L.C. only went public in 1985 on the London Stock Exchange. The stock is valued at roughly 30 times the company's anticipated 1987 earnings. Burroughs Wellcome U.S.A. already accounts for 70 percent of the parent company's earnings. Revenue from AZT will probably push the proportion still higher.

The search for the "magic bullet" against AIDS is clearly big business, but Delaney says, "What is at stake is not so much the AIDS market, but the LAV and ARC markets, worth literally billions and billions of dollars. We are talking upwards of two million people. There is tremendous battling as to who gets the lead. Burroughs Wellcome has the lead in the AIDS market, but financially the action is going to be in preventing the progression to AIDS."

Burroughs Wellcome is in the enviable position of completely controlling the distribution and pricing of a unique



commodity, because AZT is the only drug that currently has any officially recognized effect on the AIDS virus. In effect, AZT has become the industry standard against which all other drugs are judged and tested. That means that Burroughs Wellcome makes the decisions about which drug tests are conducted, not the U.S. government or scientists around the country investigating the disease.

On April 12, the *New York Times* blew the whistle on an attempt by Burroughs Wellcome to maintain a stranglehold on the AIDS and ARC markets. The *Times* said last year that researchers from the Memorial Sloan Kettering Cancer Center in New York proposed co-testing AZT with a Hoffman-LaRoche version of interferon alpha which had some effect in suppressing the AIDS virus and stimulating the immune system. Burroughs Wellcome balked. Instead, the company insisted that its own version of interferon alpha be used in a test at another medical center.

After several months of stalemate, Burroughs Wellcome finally released the AZT on condition that both interferon tests go ahead, doubling the size of the test. Larry Kramer says Burroughs Wellcome only relented because the National Institutes of Health (NIH) threatened to go public with the whole dispute.

The *Times* also said Burroughs has yet to grant permission to begin testing with another immunity booster, interleukin-2. Burroughs also declined until recently to test severely debilitated ARC patients, or AIDS patients with few symptoms.

Two other possible AIDS treatments have also gone nowhere. DNCB is an immune system stimulant discovered effective in the late 1970s. The problem is that DNCB cannot be patented, and therefore nobody can make any money off of it. Hence, commercial interest in DNCB as a treatment is less than nil.

AL721 is a food compound derived from egg yolk and has shown promise in interfering with HIV. However, the manufacturer has been unable to obtain FDA approval to import the compound from Israel where it was discovered.

AZT's nearest commercial rival, DDC,

has just been given preliminary orphan drug status, but is months away from full trials. DDC operates against HIV in a similar fashion to AZT, but is much more specific, and thus can be prescribed in smaller, less toxic doses.

PURSE STRINGS

Finally, who is going to pay for the drug? What happens to all those people who either don't have medical insurance or whose insurance carrier doesn't cover the cost of pharmaceuticals?

Burroughs Wellcome didn't sound too happy when faced with the question, and Kathy Bartlett sidled away from a direct answer, saying, "That's a question that needs to be addressed by the entire health care system—employers, insurance companies, states, and the federal government."

The Reagan administration didn't do much better. When Rep. Waxman questioned William Roper on who should pay for AIDS drug treatment, Roper said that it is "society's" responsibility. "Under our system, it is the state's prerogative to set up Medicaid as they want." Not very encouraging when some states' Medicaid programs pay as little as 20 percent or less of the cost of medical expenses.

"It's been pulling teeth to get money out of this administration for AIDS research," complains one congressional aide. Waxman is trying to shove \$30 million in emergency appropriations through the House of Representatives for the rest of fiscal year 1987. The money would be used to purchase bulk supplies of AZT to be distributed directly or in cash disbursements in proportion to each state's AIDS caseload. Waxman is also working on getting \$60 million for drugs to treat AIDS in fiscal 1988. He wants to make outpatient prescription drugs for life-threatening illnesses a mandatory provision for states to receive Medicaid. Waxman's office said both proposals are generically worded so as not to favor AZT.

Delaney argues that anybody but the patients should pay for treatment. "I have long believed that profit must be separated from our medical system. I won't go so far as to call for socialized medicine, but profit is not a legitimate method (of operation) when we are talking about living and dying."

"Let them scream socialized medicine," challenges Urvashi Vaid of the National Gay and Lesbian Rights Task Force. "One thing we should have learned from the AIDS health crises is that the health care delivery system in this country is totally bankrupt and immoral. It denies health care to people who need it most. It's not set up to deal with emergencies like this."

Meanwhile, how many will die because they cannot afford AZT?

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THE NATURE-NURTURE CONTROVERSY

Buried Alive

BY DIANE B. PAUL

According to *Science* magazine, the nature-nurture debate is "basically over." In his editorial of May 20, Daniel Koshland, Jr. asserts that recent reports of the chromosomal localization of genes related to Alzheimer's disease and to manic depression demonstrate that heredity and environment are both involved in behavioral disorders. The general conclusion that both nature and nurture affect behavior "may seem obvious to a scientist," he writes, "but our judges, journalists, legislators, and philosophers have been slow to learn this lesson."

These nonscientists, Koshland contends, stubbornly assume that when children misbehave, rehabilitation of prisoners fails, or suicides are not prevented, their environments must be at fault. But the evidence also contradicts a purely genetic explanation. "Equally simplistic is the contention that there is no crime, only disease; no guilt, only a bad combination of genes." In his view, it is no longer possible to doubt either the "mounting evidence" for the commonsensical view that both nature and nurture contribute to differences in behavior—or the relevance of that evidence for public policy.

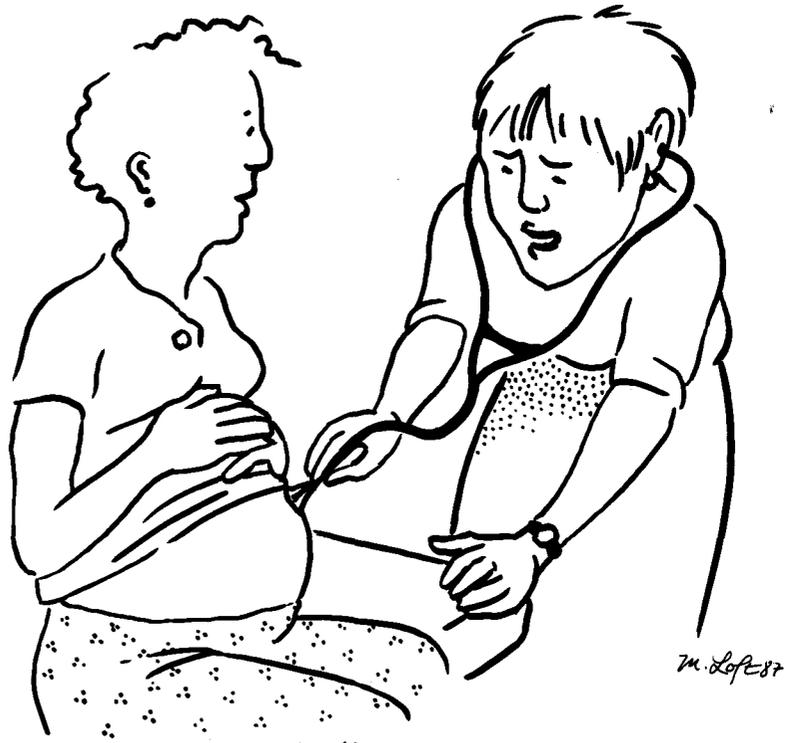
Nevertheless, those who "dread complexity" are bound to resist these findings. They will find it hard to abandon the old model that opposed heredity and environment. Nonscientists will find it particularly difficult "to cope with these complicated

relationships." In the end, however, even they will learn to live with the increasingly obvious fact that effective social policies must take account of genetic differences.

Dr. Koshland's is not the first obituary for the nature-nurture controversy. In fact, the debate was hardly underway before a victor was announced. In his 1914 Presidential Address to the British Association, Australia, William Bateson declared that the nature-nurture controversy was "drawing to an end."¹ His was but the first in a long string of similar pronounce-

ments. Indeed, one of the most frequent claims in the lengthy history of the nature-nurture debate has been that it is over. But the corpse of this particular controversy will not stay buried. Earlier reports of its demise were obviously premature. In my view, so are the most recent.

Why the persistent refusal to accept the issue as settled? Surely not, as Dr. Koshland thinks, because judges, philosophers, and other nonscientists find it hard to cope with the complexity of a position that posits more than one factor. Even if this



"Yes, Penelope, it's twins. But they say they won't come out until the nature-nurture controversy is over!"

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claim were true, it would be beside the point. The severest critics of the viewpoint articulated by Dr. Koshland are *scientists*.² Why have they been reluctant to accept the obvious? To answer this question, we need to consider some aspects of the history of the nature-nurture controversy.

In 1869, Francis Galton published *Hereditary Genius*, followed five years later by *English Men of Science: Their Nature and Nurture*—thus originating the modern debate. In these books, Galton demonstrated that high achievement runs in families. He also maintained that talent would not ultimately be thwarted by poor environments; in his view, really capable people would overcome every hindrance to success. It followed that eminence in science, the arts, and public life was largely due to natural ability.

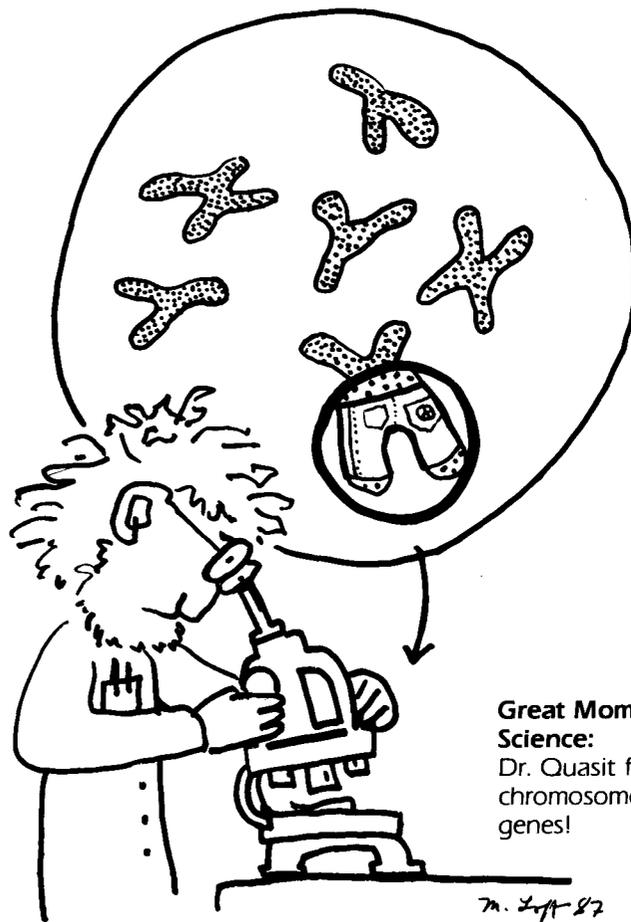
In some respects, the contemporary debate looks quite different from that of Galton's time. But certain features have also remained remarkably constant. Throughout this century, "hereditarians" have repeatedly concluded that the issue is settled. Also characteristic of this tradition is the claim that the issues are, or at least should be, strictly scientific. Thus, hereditarians have ostensibly been forced to their conclusions by the weight of evidence—often in contradiction to their prior expectations and/or personal wishes.

"Hereditarian" and "environmentalist" are contested and often confusing terms, and some discussion of their usage is therefore in order. There is no absolute hereditarian or environmentalist position. These terms have meaning only relative to each other, and to the perspective of some observer. The early hereditarian position is typified by Bateson, who maintained in his 1914 speech that "of the overwhelmingly greater significance of nature there is no longer any possibility of doubt." Few would assert this view today.

Thus, if there is a continuous hereditarian tradition, as I believe, it is one with a shifting content. At any time, we can meaningfully characterize a position as hereditarian (or environmentalist) only in contrast to some alternative.

Nicholas Pastore's 1949 book, *The Nature-Nurture Controversy*, provides a good illustration of this point. Pastore was interested in the political correlates of attitudes to the nature-nurture question. His book consists of 24 profiles of scientists active in the debate; twelve are characterized as hereditarians, twelve as environmentalists. In 1949, probably few would have argued with his assignments to either category. From the standpoint of the 1980s, however, there are a number of surprises.

Some of his environmentalists, such as John B. Watson or Franz Boas, would appear on anyone's list, compiled then or now. But Pastore also included such biologists as H.J. Muller, Frank N.



Great Moments in Science:

Dr. Quasit finally isolates a chromosome with radical genes!

M. Ziff '82

Freeman, Lancelot Hogben, J.B.S. Haldane, and H.S. Jennings. They were environmentalists only in comparison with Pastore's hereditarians (such as Bateson, Francis Galton, Karl Pearson, Edward East, Paul Popenoe, and Henry Goddard).

Although Jennings could have spoken for most of Pastore's environmentalists, his views would make him a hereditarian on today's spectrum. Jennings thought it "certain that all the things that affect character and conduct are deeply influenced by the hereditary materials. There is no characteristic or quality of human beings that is exempted from its influence. This conclusion is confirmed by all the many studies that have been made on the two types of twins. And it is in harmony too with all that we know of the science of genetics. Experimental work on the breeding of organisms shows...that they have no characteristics of any kind that are not affected by the genes that they receive at the beginning of their lives."³

Today, the key terms in the nature-nurture controversy have not only changed their meaning, but are also contested. For most of its history, participants and observers generally agreed on the content and application of "hereditarian" and "environmentalist." Some people continue to cheerfully describe themselves as hereditarians. But they are few. Today, it is generally a label

attached to one's opponents. I consider Dr. Koshland a hereditarian. I also expect that he would disagree. Thus it is a term whose meaning is not only historically specific, but relative to the assumptions of the observer.

There is a conventional understanding of the nature-nurture controversy according to which hereditarians once asserted that genes are everything. Biologists such as Bateson, Pearson, Popenoe, and East, psychologists such as Goddard and Lewis Terman, and a host of amateur scientists and eugenic propagandists such as Leonard Darwin, Harry Laughlin, and Madison Grant did assert that nature was a far more powerful influence on behavior than nurture. Pearson's claim in *Nature and Nurture* that "the influence of environment is nowhere more than one-fifth that of heredity, and quite possibly not one-tenth of it" is often cited to illustrate this view.

However, not even Pearson held that environment was powerless to shape behavior. And by the 1920s, it had become conventional to deny the opposition of nature and nurture. Charles Davenport—whose hereditarian credentials are impeccable—insisted in 1911 that "so long as we regard heredity and environment as opposed, so long will we experience endless contradictions in interpreting any trait, behavior, or disease."⁴

That statement would surely receive Dr.

Koshland's assent. And as Marxists say, that is no accident. For the "confrontation of extremes" that opposed the *allmacht* of heredity to that of environment is basically a fiction created by modern hereditarians, who are made to seem reasonable by comparison.

Dr. Koshland (and a host of behavior geneticists) appear to stand for a sensible middle ground between two absurd extremes. Ironically, radical critics of the eugenics movement have in effect colluded in this fiction. In their zeal to show just how awful eugenis were, critics have trumpeted their most extreme statements—thus feeding the perception that the "interactionist" position is, in contrast, moderate.

Through the 1960s, the environmentalist position (at least as expressed by scientists) was itself interactionist. Its successor is a product of the 1970s. Until then, no geneticist of whom I am aware doubted the existence of substantial genetic variability for mental and behavioral traits.

That situation changed as the result of a series of linked events beginning in 1969. In that year, Arthur Jensen published his *Harvard Educational Review* article asserting that at least half of the average black-white gap in intelligence quotient (I.Q.) scores was probably attributable to differences in genes. Two years later, in the *Atlantic Monthly*, Richard Herrnstein developed an analogous argument in respect to social class. (This was soon expanded to a book, *I.Q. in the Meritocracy*.) In the context of a generally radicalized academic environment, these studies prompted some

scientists to rethink conventional assumptions concerning *individual* differences in intelligence and personality. Within just a few years, the critical position had been transformed.

The nature of that revision was shaped in important ways by the Cyril Burt scandal. In his 1974 book, *The Science and Politics of I.Q.*, Leon Kamin charged that Burt's influential results (which apparently demonstrated an .80+ heritability of I.Q.) were, statistically speaking, too good to be true. This is not the place to review the history of the ensuing scandal, which has in any case been told many times. Suffice it to say that his suspicions were justified; Burt had fabricated at least some of his work and the existence of his research collaborators.

Kamin's book marked an important shift in the direction of the nature-nurture debate. After reviewing all the classic studies of the heritability of I.Q., he concluded that "There exist no data which should lead a prudent man to accept the hypothesis that I.Q. test scores are in any degree heritable." What followed was a heated debate about the standards required to demonstrate the heritability of intelligence.

When the dust settled, it was possible to distinguish essentially two positions. Critics such as Leon Kamin and Richard Lewontin stressed the methodological difficulties involved in designing experiments on the heritability of human mental and behavioral traits, including intellectual performance. They insisted that all earlier studies—not just Burt's—were vitiated by their failure to break the association of genotype and phenotype (a problem

resulting from the fact that relatives generally share similar environments). In their view, the enormous efforts required to overcome this problem were not justified either by the potential scientific or social interest of the results.

Many behavior geneticists, on the other hand, protested that the standards proposed by critics were excessively high. In their view, it was possible to design studies that met reasonable methodological criteria, and that the best of the old, plus new studies, had in fact demonstrated some heritability of individual differences in intellectual performance. They often stressed as well the potential importance for public policy of behavior genetic research.⁵

The most recent study purporting to demonstrate the heritability of specific behaviors is by Thomas Bouchard and his associates at the University of Minnesota. Their investigation of 348 twin pairs has not yet been published, though its results have been widely disseminated in the media. According to *U.S. News and World Report*, "social potency, alienation, well-being and harm avoidance were all found to be products of nature, not nurture."⁶

Time reports the investigators' question as "How much of any individual's personality is due to heredity?" and their answer is "about half."⁷ (Genes apparently have a particularly potent effect on political attitudes. According to *Time*, "a penchant for conservatism" is 60 percent inherited.)

The assertion that 60 or any other percent of a trait can be inherited is, in a word, absurd. As Frederick Osborn, the Secretary of the American Eugenics Society, wrote in 1940: "Scientists no longer ask: which is the more important, heredity or environment? Such a question lacks reality, because when two sets of factors are necessary to produce a given result...there can be no question of the relative importance of either set of factors."⁸

Translating the scientific journalese, we must thus assume that, according to Bouchard and his associates, about 50 percent of the *variation* in certain personality traits is, on average, attributable to genetic differences.

One thing is in any case certain: whatever the exact nature of the Minnesota results, both the researchers and reporters assume that they have important practical implications. According to the reporter from *U.S. News*, "Psychiatrists and social scientists have long stressed the supremacy of environment in shaping personality and their theories are the basis of many public programs that seek to reverse the social causes of poverty and crime." The clear implication of her report is that these programs have now been shown to rest on a naive belief in the power of environment.

It is tempting to focus on methodological shortcomings in recent behavior genetic studies. That was the tack taken by Kamin



"They can't bury the nature-nurture controversy now!
Our grant for the diapers hasn't come through."

in respect to Burt and the earlier generation of I.Q. studies. It has its advantage. To identify the issue as methodological is to make possible an appeal to the widest possible audience. Behavior genetic studies are judged and found wanting, not by standards peculiar to the Left, but by those of mainstream science. This strategy has costs as well as benefits, however.

One cost incurred is to reinforce the belief that it *matters* whether there is genetic variability for some mental and behavioral traits. Kamin himself has never denied this possibility. Indeed, in *The Science and Politics of I.Q.*, he wrote that "There may well be genetically determined differences among people in their cognitive and intellectual 'capacities,'" and he insisted that the book concerned only the heritability of I.Q. test scores.

However, this point has hardly been stressed since, by Kamin or other critics of behavior genetic studies. The result has been to associate critics with an apparent commitment to the zero heritability of any interesting skill or behavior. But someday a study may demonstrate, by standards acceptable even to a Kamin or Lewontin, the existence of genetic variability for some mental or behavioral characteristic. It will then be too late to say—credibly—that the results don't matter.

The methodological critique is often associated with the claim that one's own position is nonideological. Kamin is quoted in the *U.S. News* report as saying about the Bouchard study, "This has nothing to do with science. It's a political debate." Of course, he means that politics motivates the *other* side. But the issues in the nature-nurture controversy are not, and cannot be, wholly technical. To assert that one's own side stands above politics is both false to the facts and at odds with the most important point made by left critics.

It is an interesting characteristic of the contemporary debate that partisans on both sides regularly charge their opponents with being politically motivated. Behavior geneticists assert that their adversaries have been captured by ideology, thus explaining their "abuse of science." Critics charge just the same thing, in reverse.

That one's views on the nature-nurture issue are influenced not at all by one's politics is traditionally a claim associated with hereditarians. Pastore noted that of those scientists who had the opportunity to review his profiles, the sharpest reactions came from this group and he asks, "May not this differential effect be due to the fact that the hereditarians were not as willing to accept the connection between their political affiliations and scientific outlook as were the environmentalists?" The answer is doubtless yes.

But the direction of the controversy since the 1970s—with each side condemning the other as ideological—has also made it impossible for those on the Left to admit a

link between their science and their politics. The result has been a certain incoherence in the left position.

Since the early 1970s, critics of I.Q. and behavior genetic studies have simultaneously pursued two lines of argument. The first, as we have seen, is methodological: it asserts that existing studies do not meet standards rigorous enough to compel agreement with the claim that there is some heritability of any interesting mental or behavioral trait. The second rejects the equation of heritability with insensitivity to environmental change. When critics assert the irrelevance for public policy of any evidence for the heritability of particular behaviors, it is for the second reason.

Central to this latter argument is the point that the same genotype may be expressed differently in different environments. Heritability estimates thus apply only to a specific population in a specific range of environments. Unless we can map the range of environments over which genotypic expression varies, we cannot conclude with Dr. Koshland that "better schools, a better environment, better counseling, and better rehabilitation will help some individuals but not all."

That assertion may be true, but it does not follow from the fact that the relevant behaviors are heritable; it also requires the assumption that we have done all we can or will do to alter the relevant environments. That premise was implicit in Arthur Jensen's claim that black-white I.Q. score differences were largely genetic in origin. To make it explicit is to see that political as well as technical assumptions inform the "hereditarian" position—as they also do the views of its critics.

The significance of heritability estimates depends on assumptions about the likelihood and desirability of social change. On these points, conservatives, liberals, and radicals will necessarily differ.

To represent the current controversy as simply a dispute over evidence permits critics to associate their position with the cause of science, and their opponents' with ideology. But this is obviously a game that both sides can play. It would be better, in my view, for critics to admit that political as well as technical assumptions inform their position. The left perspective would thereby gain in consistency.

At present, critics simultaneously assert that their own position is strictly scientific *and* that the significance of heritability estimates depends on assumptions about the givenness of the environment. But the second claim exposes the political content in the perspectives of all the participants. Dr. Koshland's standpoint is not, as perhaps he himself thinks, value free. It depends on assumptions about the socially possible. These premises are rejected by Kamin, Lewontin, and other left critics. But that does not make their own work

assumptionless. This point should not be shocking to radicals, who have traditionally denied the possibility of a science that is wholly value free. It *should* be a threat to Dr. Koshland.

There are, of course, important methodological issues involved in the current debate. And it is necessary to identify technical shortcomings and lapses of logic in behavior genetic studies. But the nature-nurture controversy has never been, and is not now, *only* a matter of good versus bad science. The views of all the participants are ultimately informed by their politics.

To say that a view is political is obviously not to condemn it. Some scientific controversies have an irreducibly political element. That the nature-nurture dispute is one of them explains why it will not soon disappear.

NOTES

1. William Bateson, "Presidential Address to the British Association, Australia," Sydney Meeting, 1914. Reprinted in *William Bateson, F.R.S.: His Essays and Addresses*. New York: Garland Publishing Co., 1984, pp. 297-316, on p. 313.

2. For example, R.C. Lewontin, "Genetic Aspects of Intelligence," *Annual Review of Genetics*, 1975, vol. 9, pp. 387-405; A. Jacquard, "Heritability: One Word, Three Concepts," *Biometrics*, 1983, vol. 39, pp. 465-477; D. Layzer, "Heritability of I.Q. Scores: Science or Numerology?" *Science*, 1974, vol. 183, pp. 1259-1266; O. Kempthorne, "Logical, Epistemological, and Statistical Aspects of Nature-Nurture Data Interpretation," *Biometrics*, 1978, vol. 34, pp. 1-23.

3. H.S. Jennings, *Genetics*. New York: Norton and Co., Inc., 1935, p. 204.

4. Charles B. Davenport, *Heredity in Relation to Eugenics*. New York: Henry Holt and Co., 1911, p. 252.

5. For example, T.J. Bouchard and M. McGue, "Familial Studies of Intelligence: A Review," *Science*, 1981, vol. 212, pp. 1055-1059; D.R. Caruso, "Sample Differences in Genetics and Intelligence Data: Sibling and Parent-Offspring Studies," *Behavior Genetics*, 1983, vol. 13, pp. 453-458; J.M. Horn, J.C. Loehlin, and L. Willerman, *Behavior Genetics*, 1982, vol. 12, pp. 479-516; R. Plomin and J.C. DeFries, "Genetics and Intelligence: Recent Data," *Intelligence*, 1980, vol. 4, pp. 15-24.

6. Julia Reed, "Genes: Little Things that Mean a Lot," *U.S. News and World Report*, Dec. 15, 1986, p. 8.

7. "Exploring the Traits of Twins," *Time*, Jan. 12, 1987, p. 63.

8. Frederick Osborn, *A Preface to Eugenics*. rev. ed., New York: Harper and Brothers, 1940, p. 81. Similarly, Curt Stern: "It has been an age-old question to ask, 'How much of the specific phenotype of an individual is due to heredity and how much to environment?' In this form, the question lacks meaning. No phenotypic trait is independent of either heredity or environmental agents, and an attempt to divide into 2 fractions the interrelation of 2 agents, neither of which alone can produce a phenotype, is logically impossible." *Principles of Human Genetics*, San Francisco: W.H. Freeman and Co., 1949, p. 453.

MICROWAVES VERSUS HOPE

The Struggle at Greenham Common

BY JOSEPH REGNA

On the Caribbean island of Guadeloupe in January 1979, U.S. President Jimmy Carter met with the heads of state of West Germany, France, and Britain and secretly agreed to install a so-called new generation of nuclear weapons in several Western European countries. In December 1979, NATO ministers formally agreed to deploy 108 Pershing IIs and 464 ground-launched cruise missiles—known as the Euromissiles—beginning in late 1983.

One of the destinations of the cruise missiles is also the site of the longest continuous protest presence against nuclear weapons buildup: the U.S. Air Force Base at Greenham Common, located in the British countryside 60 miles from London. The base is bounded by a nine-mile perimeter fence, broken only by gates named by color. Since September 1981, women have maintained peace camps at these gates, most notably and visibly at Green Gate.

Once the missiles themselves started arriving three years ago, an escalation and shift in protest activity ensued. The reason lies in the very nature of cruise missiles: their mobility. A cruise missile is small enough so that it can be mounted on the back of a truck—called a launcher vehicle—and driven to some predetermined launch point.

In preparation for nuclear war, the U.S. military at Greenham Common has engaged in about 30 “dispersal exercises” since March 1984. During an exercise, a convoy of cruise missiles leaves the base in



Photo/Bob Naylor



the middle of the night, travels the back roads of the British countryside, and returns several days later. Each convoy consists of four 52-foot launcher vehicles, each carrying up to four missiles, two control vehicles, up to sixteen support vehicles, and a large police escort—all told, around 32 vehicles extending over a quarter mile.

Once a convoy leaves Greenham Common, the women of the peace camp start spreading the word that a dispersal exercise is in progress. This message is carried through the Cruisewatch network, ensuring that the exercises are never secret, as the military meant them to be. Because of this network, the cruise exercises have always been confronted with vigorous and continuous protest—along the convoy route (even to the point of stopping the convoy), at the launch site, and at Greenham Common itself.

Greenham protester and peace activist Kim Besly tells why the Cruisewatch network and encampment continue to thrive. "It's the women that provide the next generation, and women have always grieved in times of war. And I think what women are saying now is we're tired of providing the cannon fodder. There must be a better way."

ZAPPING THE WOMEN

Two things have changed dramatically, however, since the fall of 1984: many, if not most, of the women have become ill, and the massive police and army presence guarding the base has virtually disappeared.

The first physical symptoms the women observed occurred on October 15, 1984. On that day, the women noticed the same plane continuously taking off and landing. During this activity, the women noted that at particular points by the perimeter fence, many of them were getting headaches. But headaches were only the mild beginning to this story. It was much later, when a whole range of new and startling symptoms surfaced, that the women realized that something unusual was happening. They later recalled that in September 1984, one month prior to the first appearance of

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symptoms, many new and different antennae had been installed at the base.

Greenham women have experienced both physical and psycho-emotional symptoms. The physical include vertigo, headache, earache, sensation of the eyes being pulled out, retinal bleeding, lisping and slurred speech, swollen neck glands, burnt face (even at night), dizziness, lack of coordination, nausea, vomiting, diarrhea, sleep disturbance, palpitations, pain in the ovaries and uterus, irregular menstrual cycles, and postmenopausal breakthrough bleeding. Psycho-emotional symptoms include lack of concentration, disorientation, loss of memory, depression, irritability, aggressiveness, lack of confidence, sense of loneliness, and a sense of panic in nonpanic situations.

Kim Besly is one woman who has experienced health problems at the Greenham women's peace camp. Although she describes herself as "a very ordinary mother and grandmother," Besly's symptoms of pain in the uterus and postmenopausal bleeding are anything but ordinary. Neither are those of her daughter, another camp protester, whose less frequent menstrual periods took a whole year to revert to normal.

But Kim Besly's hope remains as strong as ever. "Despite the mud and the barbed wire and the verbal abuse and so on, Greenham is a very special place and it draws you back," she says. "There's a kind of vision there that something good has got to come out of this."

The Greenham women report that the prevalence and intensity of the symptoms increase at specific points along the fence—particularly at Green Gate—at times when there are many women demonstrating, and when cruise missile convoys exit and return. Visitors to the peace encampment, both men and women, report experiencing the same types of symptoms and the same pattern of variation as do the Greenham women.

MEASURING MICROWAVES

Once they believed that a connection existed between what was going on inside the base and their symptoms, the women at Greenham enlisted the assistance of Dr. Rosalie Bertell, an authority on the biological effects of nonionizing radiation.

Bertell's measurements at Greenham showed strong electromagnetic radiation levels, including microwave frequencies, that coincided spatially and temporally with the women's symptoms.

When a woman would say, "It's strong here," that's what the meter would show. When a woman would say, "It's not strong here," the meter would show that too. Once, when a convoy was leaving the base and the women noticed that base personnel saw that they were taking radiation measurements, the women figured that whatever was causing the symptoms was "switched off" because no one felt anything.

Members of the British group Electronics for Peace have confirmed Bertell's findings during their measurement activities. In fact, they found microwave levels to be up to 100 times more than background levels, and concluded that since the radiation might be pulsed, their meter may have been recording an artificially low average value. These results, coupled with her experience, led Bertell to conclude that the symptoms women have been experiencing are consistent with exposure to low-level microwave radiation.

VIOLENCE AGAINST GREENHAM WOMEN

It would be a mistake to think that prior to the onset of the health problems, the Greenham women's protests came without cost. Beyond the expected arrests, there have been physical attacks on women, strip searches, the extinguishing of camp fires in the middle of winter, and evictions and destruction of campsites and equipment.

Police brutality has been severe, almost deadly: picking up and throwing individual women into groups of other women, driving police cars at high speed through groups of women, and physical abuse with apparent intent not just to scare, but to kill.

During one Cruisewatch exercise, the police seized one woman, Blue Joyce, and dragged her into the back of a van filled with police. After the police had abused her, the van subsequently caught up with and passed the convoy. One of the women recounts:

"The police then talked of 'excess baggage.' Next came the 'countdown for excess baggage: 10, 9, 8, 7, 6, 5, 4, 3, 2,



Photo/Bob Naylor

l'—the back doors were opened and they tried to push Blue out of the still-moving van. But she resisted, clinging to the inside. So a policeman jumped out to drag her out, but the van was going too fast for him to keep up.

"After the van slowed down, Blue was dragged out and left lying in the road in a state of shock. The cruise convoy then approached with its police escort. The police vehicles swerved around Blue, not stopping. Just before the massive cruise vehicles bore down on her, Blue managed to crawl onto the verge. Much later, a passing car gave Blue a lift. She was still in a state of shock, vomiting continuously, and was taken to hospital."

With the police brutality and presence now markedly less than it used to be, it seems that the military has traded this more visible type of repression for the more politically acceptable and invisible punishment from microwave radiation. As Kim Besly observed, "It is easy enough to kill people. It is harder not to kill them but to stop them all the same. The principle is not really one of minimum force, but of minimum political reaction."

MICROWAVE EXPOSURE & SURVEILLANCE

Nearly a year after Dr. Bertell's spring 1985 Greenham visit, two British newspapers revealed what may be the crucial link in explaining the mystery behind the women's symptoms. *City Limits* claimed that the British Ministry of Defence is probably using its new intruder detection system CLASSIC (Covert Local Area Sensory System for Intruder Classification) around Greenham Common. The *Manchester Guardian* wrote that "the U.S. employs an intruder detection system called BISS (Base Installation Security System) which operates...on a sufficiently high frequency to bounce radar waves off a body moving in the vicinity of a perimeter fence." Both the British CLASSIC and the American BISS employ microwaves to detect anything that gets in their path.

Is what's happening to the women at Greenham Common an attempt to electronically subdue them, or the result of the use of radar surveillance? Is it deliberate, or is it incidental to the

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MICROWAVES AND THE MILITARY

The military has known for more than fifty years that microwaves are dangerous. As early as 1930, the U.S. Navy found that people who stood in front of antennae would experience discomfort, weakness, drowsiness, and headaches. The U.S. Air Force, in a 1955 study, discovered that standing in the way of radar beams caused ringing in the ears, buzzing-type vibrations, pulsations, and tickling around the head and ears.

Project Pandora, a 1965 study on chimpanzees done in response to the microwave bombardment of the U.S. embassy in Moscow, concluded, "The potential of exerting a degree of control on human behavior by low-level microwave radiation seems to exist." Richard S. Cesaro, the project's director, urged that the effects of microwaves be studied for "possible weapon application."

This recommendation seems not to have gone unnoticed. In 1972, the Pentagon admitted that the Army had, in fact, tested a microwave weapon, what it called an "electronic flame thrower." Also in that same year, a U.S. Army Equipment and Research Center study, "Analysis of Microwaves for Barrier Warfare," stated that it was possible to field a truck-portable microwave barrier system that would completely immobilize people in its path.

Whether such a device or one of its technological offspring has ever been used is not certain, but the utility of such an approach to control people almost precludes the possibility that usage has not occurred. Robert Becker of the Syracuse, New York Veterans Administration Hospital put it this way in a 1985 interview: "If energy we can't see, feel, smell, or taste can wreak havoc with our immune systems and even upset brain chemistry, it would seem to be the ideal

weapon."

Adding credibility to such speculation is the startling assertion by Eldon Byrd, a researcher with the Naval Surface Weapons Center in Silver Spring, Maryland. "Between 1981 and September 1982 the Navy commissioned me to investigate the potential of developing electromagnetic devices that could be used as nonlethal weapons by the Marine Corps for the purpose of 'riot control,' hostage removal, embassy and ship security, clandestine operations, and so on," Byrd stated.

There is evidence that the U.S. government has already used "energy we can't see, feel, smell, or taste" against people it regards as enemies. For example, the U.S. employed ultrasound in Vietnam to disorient and demoralize the Vietnamese people. Specifically, the U.S. used a device known as the "squawk box" or "sound curdler," which produces a scientifically designed shrill, shrieking noise in the ultrasonic range and causes people to experience nausea, giddiness, permanent impairment of hearing, and mass psychological distress in crowds.

A report in *Electronics Today* in December 1985 stated that police forces in the U.S. have carried out trials with infrasound generators mounted on the back of trucks. In addition, police forces in Britain have been known to use a device called a "photic driver," a glorified strobe light that causes giddiness, nausea, fainting, and epileptic seizures in those exposed. After 1983, a form of the photic driver, the Valkyrie, and other so-called frequency weapons were completely eliminated from the British Defence Equipment Catalogue, though all were still in use, at the request of the British Ministry of Defence.

ASTRONOMY'S ANTI-STAR WARRIORS

Saving the Stars
From Nuclear War



BY STEVE NADIS

In June 1985, a man rammed an automobile into the doors of the Maui Optical Tracking Facility, protesting a missile tracking experiment conducted for the Strategic Defense Initiative (SDI) program. The incident is considered the first "terrorist" attack on an astronomical observatory.

Although no one was hurt by the collision, astronomer Thomas Hockey of New Mexico State University is concerned that the event may signal a change in public attitudes toward astronomy—what he calls "one of the last 'pure' sciences in the public imagination."

Writer Steve Nadis specializes in astrophysics, nuclear war, and the "inner game" of volleyball.

"But when will people begin to notice that, for economic, political, and other reasons, more and more persons trained as astronomers are looking less at the stars and more at Star Wars?" Hockey asked. "In particular, will they soon realize that the principal problems involved with SDI are astronomical ones? Could the time come when astronomers are viewed first as specialists in weapons research?"

Rick Harnden, an astronomer at the Harvard-Smithsonian Center for Astrophysics (CFA), acknowledges that the boundary between star wars and pure astronomy is often quite fuzzy. The Defense Department, for example, pays astronomers to monitor the infrared brightness of stars to make sure a starburst is not mistaken for a missile launch. Improved infrared sensors would

benefit not only astronomy, but also missile defense and antisatellite systems.

Studies of radio jets—huge outpourings of energy found outside galaxies—could eventually lead to better particle beam weapons. Interferometry—an astronomical technique which uses distant radio sources to measure positions on earth very precisely—could be useful in missile guidance systems. Interferometry also helps astronomers determine whether a distant light source is a single star or perhaps two or three stars. "The Air Force wants to use this to look at Soviet geosynchronous satellites and find out how many are up there," CFA astronomer Mark Lacasse said. "They can see these satellites going into orbit with regular telescopes, but can't tell whether the Soviets might release other satellites—

such as 'space mines'—once they're up there."

Another problem critical to astronomers and Star Warriors alike is finding ways to counteract the scattering of laser beams as they pass through the earth's atmosphere. Stars, as viewed from the earth, appear to twinkle owing to atmospheric turbulence, and astronomers have developed techniques to minimize the blurring. "Laser weapons travelling from earth to space might use something like that in reverse to correct for atmospheric distortions," Lacasse said.

"For some of us, there's a fine line between helping out the defense of our country and stimulating an insane arms race," Harnden said. "How do you know whether monitoring the infrared brightness of a star helps our defense or hurts? It often comes down to a personal decision."

"Just about any kind of research can be misused," said CFA astronomer Dan Harris. "My philosophy is that if you're sure your work will be misused, you have a responsibility to cease and desist. But if it's your own research, which conceivably might be misused, you go ahead and do it." Since taking a summer job at the National Testing Station at China Lake, while still a college student, Harris has refused to do any research that requires security clearance. He has, however, received Air Force funding for "basic" astronomy research which had no military applications. "There are significant numbers of people who aren't doing Star Wars research now, but whose work is so close, they could be a couple of years from now," he noted.

For example, in a year or so, Lacasse will be doing a project for the Air Force. "It won't be Star Wars, but it is Air Force money," he said. "And that will pay my bills."

Mike Ratner, now at the CFA, checked with an employment agency after finishing graduate work in astrophysics. "I was told the best job for me was in missile guidance," he said. "There was a lot more money in that than spacecraft navigation (which had been my specialty), but I never pursued it."

Harnden, Harris, Lacasse, and Ratner are members of the CFA-based Nuclear Discussion Group, which has been meeting on a weekly basis for the past four years to discuss what astronomers can do to curb the arms race.

"The thing that pushed me over the edge," Harnden explained, "was the movie *The Day After*," shown in November 1983. "The media was advising everyone about preparing

children for the show. I have three kids myself, but I decided, heck, why don't we get people from CFA talking about it? So I put some notices on bulletin boards telling them to see the movie and talk afterwards. That's how we started."

The group discusses all aspects of the nuclear arms race, but focuses on Star Wars because it borders so closely on their field of expertise. The other reason for concentrating on SDI is that—at \$5 billion a year and a potential trillion-dollar overall price tag—it is the biggest, costliest military venture ever proposed, dwarfing the Manhattan Project and strategic weapons systems such as the MX missile and the B-1 bomber.

"We look at Star Wars as astronomers," Harnden said, "and try to evaluate it technically—infrared sensors, space mirrors, lasers, computers, and software—all things we use in our work. One of our former members was actually in favor of Star Wars, but the rest of us think it's madness."

In addition to trying to raise the awareness of fellow astronomers, the group also reaches out to students and the local community by teaching courses and sponsoring regular lectures on Star Wars and the arms race. "One of the issues we formed around was to let students know about the potential implications of their work," said George Field, a world-renowned astronomer, the former director of the CFA, and an active member of the group.

"There's always the possibility that graduate students could be working on something related to SDI without even knowing it," said David Spergel, a former student of Field's and now a post-doctoral fellow at Princeton's Institute of Advanced Studies. Spergel looked into that issue while serving on Harvard's Graduate Student Council. He found that the problem was less likely to occur at Harvard than at other universities more eager to take SDI funding. "In some cases, a student might pursue research for years, only to find that under SDI rules his work has been classified," Spergel said.

Going beyond the confines of Harvard and the Boston metropolitan area, Field recently arranged a meeting between Soviet scientists and CFA astronomers. "They shared our view that Star Wars is insane," Harnden commented. "Which is not surprising, since Gorbachev also shares that view."

Last year, Field and Spergel coauthored an article for *Science* magazine which strongly criticized space-based laser systems, a key component of SDI. The

government dropped the approach shortly thereafter. "I can't say this article killed it," Harris said, "but it definitely helped."

Also last year, 3,700 U.S. professors and senior researchers (comprising more than half the science faculty at 109 universities and research centers, including the CFA) plus 2,800 graduate students signed a petition not to accept money for Star Wars-related research. (See Seth Shulman's article, "Stopping Star Wars," in the January/February 1986 issue of *SftP*.)

Since then, 7,000 U.S. scientists have signed the petition, as have 12,000 scientists worldwide. This includes 3,000 Japanese scientists and 1,000 British scientists, more than half the scientific membership of Britain's Royal Society. By making this pledge, these scientists, including several members of the Nuclear Discussion Group, jeopardized future sources of funding.

With billions and billions of dollars committed to Star Wars, many scientists find the money hard to resist. Harris plans to investigate how much CFA astronomers receive from the Star Wars program. The bottom line in Harris's view, however, is that astronomers must take a stand, regardless of personal or professional risk. In the newsletter *Astronomers and the Arms Race*, which he has helped publish for the past two years, Harris asked, "Is it possible we scientists have become the universal soldiers for the arms race?"

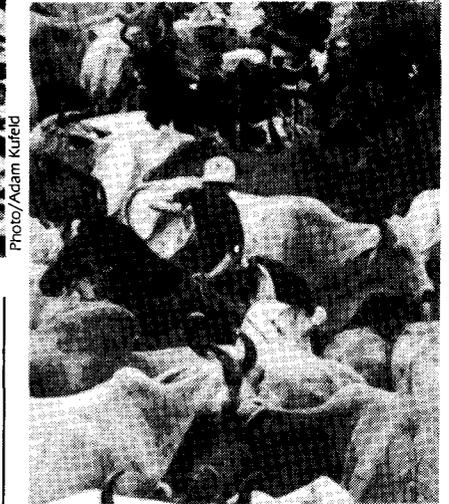
"Classically, we scientists defer decision-making to government and even to industry, just as the foot soldier obeys the orders of his superiors," Harris said. "It is time to choose a new path. We don't have to be universal soldiers."

Charles Hyder is one astrophysicist who chose such a path, carrying his protest of the nuclear arms race to an extreme. For over seven months, from September 1986 to May 1987, he staged a hunger strike in front of the White House. (See Newsnotes in the March/April 1987 issue of *SftP*.) "Our system responds to dead bodies," Hyder said. "With a holocaust you can't fix it afterward, so you have to offer up the bodies in advance." He ended his strike to launch a seven-month, 150-city nationwide tour in a live-in station wagon, trying to make global disarmament the key issue in the 1988 presidential campaign.

"Hyder feels there's a mass movement out there waiting to happen in the U.S. and the world," Harris said. "He sees himself as that small pebble that just might start the avalanche." 



Photo/National Geographic



Scorched earth destroys the environment in El Salvador, while Costa Rican cattle (insert) are raised for fast-food burgers and pet food in the U.S.

ENVIRONMENTAL ACTION FOR CENTRAL AMERICA

Confronting an Ecological Crisis

BY BILL HALL

Central America's rapidly deteriorating natural environment has failed to gain the attention of policy makers in Washington, who are more concerned with stemming the tide of social change in the region. But, as biologists, geologists, planners, and naturalists gathered at the First Central American Environmental Conference warned in a joint declaration, "If this process of environmental deterioration is

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allowed to continue, it will make future development impossible and will deepen social instability."

More than 150 environmentalists from across Central America gathered in Managua, Nicaragua on May 13-16, 1987 to confront the region's severe ecological crisis. Massive deforestation, widespread pesticide poisoning, extensive soil erosion, and loss of wildlife habitats threaten all the countries of the isthmus, and are inextricably linked with the region's crushing poverty.

Central America is a biologically rich region. Volcanic soils, dense tropical rain forests, and many exotic plant, animal, and insect species have given the area its unique natural beauty and made it well-suited for sustaining human civilizations. But since the expansion of export agriculture began in earnest in the twentieth century, environmental destruc-

tion has increased alongside poverty in the region.

Central America's rain forests house some of the densest concentrations of biological diversity in the world. Like other rain forests, they are home for the majority of the earth's species. But today, two-thirds of Central America's forests have been destroyed, and destruction continues in the region at the rate of 4,000 kilometers annually.

Deforestation is a result of the unequal distribution of land that characterizes Central American economies. Wealthy landowners push peasants off the land in order to enlarge their holdings for export crop ventures, or keep the land idle for speculation. The landless peasants are among the poorest of the poor in Central America. In search of arable soil, they migrate to tropical forests. Tragically, rain forest soil is unsuitable for agriculture—the forest's fertility is held in the foliage itself—and peasants must abandon their farms and move on in just a few years, slashing and burning more forest to farm.

Large landowners also cause deforestation through cattle ranching. Since 1960, one-fourth of the rain forest in Central America has been cleared to accommodate Del Monte, Swift-Armour, and other transnational demands for cheap beef. The meat winds up in fast-food hamburgers and pet food in the U.S. Central America's highest rate of deforestation is in Costa Rica, where the country's huge external debt has led to an emphasis on export ventures to earn foreign exchange for interest payments.

The implications of forest destruction are catastrophic. The area where rain forest trees are destroyed quickly loses its topsoil. Erosion of watersheds is a serious problem, and rivers fill with silt washed away from deforested lands. Habitats disappear and many animals have become extinct. Aquatic ecosystems such as the reefs and mangrove swamps of Central America's Caribbean coast have become choked with silt.

Impoverished peasants have also deforested other lands, leading to a shortage of fuel wood and worsening poverty in the region. The continued flooding in Managua, Nicaragua has resulted from deforestation of the hillsides surrounding the city.

Pesticide poisoning presents another serious hazard in Central America. Nicaraguans and Guatemalans have more of the deadly pesticide DDT in their bloodstreams today than any other people on earth. The average DDT levels in Guatemalan cows' milk is 90 times higher than that allowed by U.S. standards. Agricultural workers aren't given protective clothing when they apply pesticides, and the areas where they work are often sprayed by crop-duster planes. While most of these workers cannot read the warning labels on pesticides, warnings written in English offer little protection even to those who can read.

To combat increasingly resistant insects, cotton farmers and other large growers stepped up pesticide application to 20-30 times per season in the 1970s. Encouraged by U.S. chemical companies, 40 percent of all U.S. pesticide exports went to Central America in the seventies. Pesticide runoff has contaminated water and saturated the land of the fertile Pacific plains of Central America. Not surprisingly, there are few birds of any kind left in that area. Even honeybees have disappeared, upsetting pollination and the life cycles of plants.

Through this circle of poison, pesticide-contaminated products wind up on the dinner tables of U.S.

consumers. Says Alexander Bonilla, a Costa Rican environmentalist, "Transnational corporations are sending us great quantities of pesticides outlawed in the U.S. and Europe. As a result, we are exporting contaminated oranges, meat, and mangoes back to consumers in those countries." More than 74 percent of the pesticides used in Central America are banned, restricted, or unregistered in the U.S.

Central America's water supply has been poisoned by pesticide runoff, industrial contamination, raw sewage dumping, and sedimentation caused by deforestation and agricultural practices. Enteritis and diarrheal disorders, caused by polluted water, remain the major causes of death in Belize, Guatemala, Honduras, and Nicaragua. Nicaragua's Lake Managua contains toxic levels of mercury, dumped by the U.S. electrochemical manufacturer Penwalt.

While its literacy, health, and land reform programs have received more international attention, Nicaragua's economic and political revolution has also meant a reversal of the environmentally destructive policies of the past. The new government faces a legacy of environmental degradation as well as poverty. As Nicaraguan National Parks director Lorenzo Cardenal describes, "Four hundred years of Spanish conquest and one-and-a-half centuries of North American occupation and puppet governments visibly destroyed the natural wealth of Nicaragua. Somoza opened the country to private enterprise which disregarded the Nicaraguan environment."

Today agrarian reform is removing the root cause of much environmental destruction, as well as poverty, in Nicaragua. Granting land to peasants has virtually eliminated pressure to colonize the rain forests, as well as improved nutrition. The new government has banned DDT and DBCP, two deadly pesticides which were widely used under the Somoza government and are still used in the rest of Central America. On the Pacific coast, a program has been introduced to protect the endangered Ridley and Loggerhead sea turtles. Millions of saplings have been grown for reforestation efforts and watershed management.

But U.S. intervention in Central America is propping up the environmentally destructive unequal economies in the region. It is also causing the diversion of funds from environmental programs to arms spending. As Lorenzo Cardenal explains, "War is Nicaragua's principle environmental problem. *Contra* military

actions destroy our natural resources, such as one attack on Atlantic coast reforestation workers and another where 140,000 hectares of forest were set on fire."

Environmental projects and environmentalists are targeted by the *contras*. "In the past four years, more than 70 environmental and forestry workers have been killed or kidnapped by the *contras*," Cardenal explains. U.S. citizen and environmentalist Benjamin Linder was executed by the *contras* while working on an appropriate technology hydroelectric project in El Cua, Nicaragua. The project was part of a regional ecologically sustainable development plan initiated by the Nicaraguan government.

War takes a heavy environmental, as well as human, toll throughout Central America. Scorched earth warfare in El Salvador involves the bombing of villages, crop lands, and forests, while warfare has also led to numerous forest fires. The soil erosion that ensues causes dust storms, siltation of reservoirs, and the drying up of natural springs. "Daisy cutter" anti-personnel bombs explode at ground level, clearing the area not only of human beings but of forest cover as well. Dr. John Conable, a prominent U.S. burn surgeon who visited El Salvador in 1984, saw "perfectly classical, clear-cut cases" of napalm burns. White phosphorus, a poisonous incendiary bomb, is also used there. These chemicals destroy wildlands and contaminate the soil and water.

In Honduras, U.S. military roads, bases, and airstrips criss-cross the countryside, displacing people and destroying wilderness. The Honduran State Forestry Corporation reported that the "Cabanas '86" U.S. military maneuvers destroyed ten percent of the country's pine forests in the savannas near the Nicaraguan border. As military roads are cleared through rain forest, landless peasants have a new pathway to colonize previously untouched areas.

As a U.S. National Guard spokesman told the *Washington Post*, engineering projects in Honduras are "less environmentally constrained. If you're building a road, you don't have to worry about the width of the culverts, about the Environmental Protection Agency, or about the environmentalists. Those aren't concerns down there."

Activity by the U.S.-backed *contras* also has an environmental impact in Honduras. According to newspaper accounts of a confidential Honduran presidential report, "the *contras* have generated a wave of destruction in

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REMEMBERING BEN LINDER

A
March
For
Peace
In
Nicaragua



BY JEFF WOODSIDE

On April 28, 1987, Benjamin Linder, a 27-year-old North American engineer, was murdered as he arrived at his work site in northern Nicaragua. He was killed, as were his two Nicaraguan coworkers, Sergio Hernandez and Pablo Rosales, by the U.S.-funded and directed contra. The murders were not an isolated, random incident, but part of the systemic aggression and terror which the United States continues to wage against Nicaragua.

Jeff Woodside is teaching physics at UNAN, the National Autonomous University of Nicaragua, through SfiP's Science for Nicaragua project.

Ben Linder was well known and respected in the towns where he worked and within the community of North Americans in Nicaragua. With his loss, many of us felt for the first time the kind of personal pain and grief which Nicaraguans have had to deal with on an almost daily basis. Since 1981 the contra have murdered over 16,000 people, many of them teachers, doctors, community leaders, and development workers—people who are crucial to Nicaragua's progress. Ben's death was unique only in the fact that he was a North American.

Ben was an electrical engineer, a rural development worker dedicated to building the infrastructure necessary for economic development in the remote north of Nicaragua. His specialty was

small-scale hydroelectric power, and he had supervised installation of a 100-kilowatt plant that has brought electric light and power—for tools, refrigeration, water pumps, and machine shops—to the people of El Cua for the first time. At the moment of his death, he was doing water flow surveys on a river near San Jose del Bocay—preliminary work needed to bring electricity to that community as well.

Part of our response to Ben's murder and the policy of terror which caused it was to organize a march for peace through the northern region of the country where Ben had worked. Seventy U.S. citizens participated in the march on May 16 and 17, which was sponsored by three organizations—the Committee of

Report

U.S. Citizens Living in Nicaragua, the Ecumenical Committee of U.S. Church Personnel in Nicaragua, and the U.S. Veterans Peace Action Team. The march covered 44 kilometers, from the town of El Cua, where Ben had lived and worked for many months, to San Jose del Bocay, where he and his coworkers were killed.

There were several purposes common to all of us for the march. First, we wanted to demonstrate that in the international community, we would not be intimidated or moved from our lives and work here in Nicaragua by the attack against our companero, or by threats from the U.S.-contra terrorists. Shortly after Ben was killed, the FDN, one of the contra groups, announced that internationalists should leave Nicaragua or "face the consequences."

Another purpose for the march was to visit the areas where Ben had lived and worked in order to meet the people there and express to them our solidarity with their struggle, our resolve to work to end the U.S. aggression in Nicaragua, and our commitment to continue the development work that Ben had started. A special concern was to visit the families of Ben's murdered coworkers, Sergio and Pablo, to offer them our love, support, and solidarity.

A third purpose was to state clearly our continuing support for the Nicaraguan revolution and its effort to build, in the face of great obstacles, a new life in this country—better, more just, and a life in which everyone can enjoy peace and freedom, decent food and housing, health care, and education.

On the morning of May 15, we met in Jinotega, a principle city in northern Nicaragua, and there climbed aboard flatbed trucks for the trip to El Cua, the town where Ben Linder's work has had the greatest impact. Evidence of the U.S.-backed terrorist war appeared shortly. Still in the trucks, we passed a privately owned coffee farm that had been attacked and burned by the contra, and upon reaching El Cua we attended the funeral of two militiamen from that town who had been killed the day before in an ambush. That simple ceremony in the hillside cemetery of El Cua, amid people who have suffered such loss, helped fix for us the terrible human costs of this immoral war.

After spending the night in El Cua's municipal building, we visited the hydroelectric plant, which itself had been attacked by the contra several weeks earlier and was successfully defended by its Nicaraguan manager. The turbine and

generator, the water piping, and spillway were impressive in their economy of design. Here we recalled that Ben Linder was killed at point-blank range. The autopsy revealed that he was shot in the head from less than three feet away. It is clear that the contra knew who they were killing. Ben was murdered because his work was effective, because it made a tangible difference to Nicaragua.

The final destination of the first day's walk was the small cooperative community of El Cedro, where we received a warm and spirited greeting from the townspeople. There we encountered evidence of the terrorist practices of the contra that touched us very directly, for during the welcoming ceremony at the cooperative, community leader Don Pablo Blanco showed us two land mines that had recently been discovered buried in the road that we were to travel the next day. These devices, supplied by the United States, have killed many people in Nicaragua. Before entering El Cedro we had passed the site, now marked with several crosses and twisted wreckage, where one such mine murdered 32 civilians traveling in public transportation vehicles. Later, closer to Bocay, we would pass another such site where a Spanish nurse, Ambrosio Mogorron, and eight Nicaraguan companions were killed in the same manner.

The people of El Cedro demonstrate the meaning of courage. Three times the contra have attacked the settlement and destroyed the health center and school. Three times the people have rebuilt them. This is the story of too many rural Nicaraguan communities.

We passed the night in El Cedro and the next day walked the remaining 20 kilometers to our final destination of San Jose del Bocay. Perhaps the most moving of the experiences of the march were the greetings and expressions of solidarity which we received from people along the route, and of these, none was more heartening than the welcome we were given near Bocay.

In Nicaragua, an important organization is that of the mothers of those who have given their lives in the struggle for freedom. They are known formally as the Mothers of Heroes and Martyrs. Perhaps 200 such women and their children marched out about two kilometers from town to meet us along the road. They carried banners and placards, makeshift in form, constructed with whatever materials were at hand—a tree branch, an old piece of cloth, a broom handle. The dignity of these women, their strength and tranquility, and the

love and determination in their eyes was overwhelming.

As we entered San José del Bocay, walking side-by-side with the Mothers of Heroes and Martyrs, our march came to an end. The next day most of us would return to Managua, first in trucks, passing the same road we had walked, and later by bus from Jinotega to the capital. We felt we had accomplished our immediate goals, but realized that much work lay ahead.

The march had been a learning experience. It had helped us understand more clearly than before the meaning of this war in the lives of the Nicaraguan people; we could now measure more directly the suffering that the U.S. government has inflicted here. During the march, we had witnessed an incredibly courageous people, working and fighting, committed to endure whatever sacrifice is necessary to achieve their liberation.

The Nicaraguan revolution is an example and an inspiration for all the world's people, including our fellow citizens in the United States. It is this example which threatens the U.S. government and corporate system. For if revolutionary Nicaragua survives, and it must survive, it will demonstrate that a small, poor, and long-exploited society can successfully challenge the hegemony of the United States to demand and achieve economic and political self-determination.

The experience of the march for peace reaffirmed and strengthened with vivid images our commitment to work to ensure the survival of this process. We left the march more determined than ever to stop, in all of its forms—economic, political, and military—the unjust, immoral, terrorist war which the United States government is waging against the people of Nicaragua. 

Members of Ben Linder's family have been touring the United States since June to talk about Ben's volunteer work in Nicaragua, technical aid, and the significance of his death for U.S. foreign policy in Central America. Science for the People is cosponsoring the tour's visit to Boston from October 15-18. The tour is also raising money for the Benjamin Linder Memorial Fund to complete the hydroelectric power project that Ben was working on when he was murdered by the contras. Tax-deductible contributions may be made to the Linder Memorial Fund/El and sent to the fund in care of the Portland Central America Solidarity Committee, P.O. Box 6443, Portland, Oregon 97228.

The Vanishing Forest The Human Consequences of Deforestation

The Encroaching Desert The Consequences of Human Failure

Reports for the Independent Commission on International Humanitarian Issues

Zed Books, London and New Jersey, available from Humanities Press, Atlantic Highlands, NJ 07716, 1986, \$6.95 each, paper

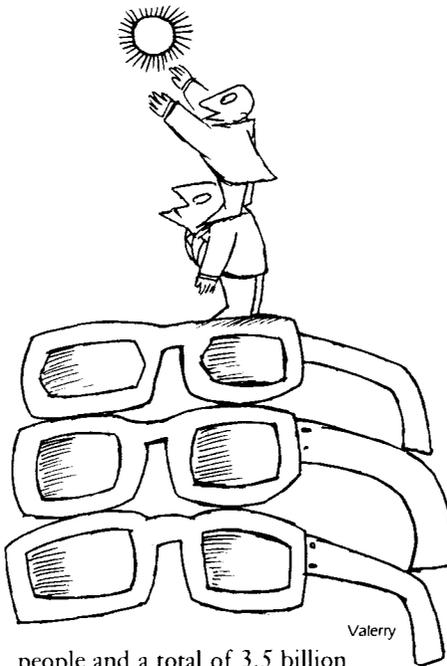
Ecological sanity is a necessary goal, not merely for its own sake, but also for human—and economic—survival. Humanity's failure to comprehend and act on this fundamental truth will result in its own demise. Stated simply, that is the message of these exposes of the crises of deforestation and desertification occurring particularly in those countries where the bulk of humanity lives: the Third World.

Logging, dam building, ranching, highway construction, mining, slash-and-burn agriculture, resettlement programs, and poverty threaten the forests in Third World areas. Desertification results from overgrazing, overcultivation, forest destruction, mismanagement of water resources, urbanization (from increased demand for firewood), and poverty. As befits the ecological nature of the situation, not only do deforestation and desertification share causal factors, but these factors are themselves interdependent. They reinforce one another, acting synergistically to accelerate the whole process of ecological destruction.

The ecological consequences ring familiar: extinction of species, soil death, and even climate change. These, in turn, can result in unexpected events. For example, much of the damage caused by the 1983 resurgence of the El Nino current off the northwestern coast of South America was due to deforestation in the Amazon basin.

But it is in illuminating the human endpoints of these processes that these books really shine. Damage to people and their lives need not wait until some abstract threshold, like carrying capacity, is exceeded; it is happening right now.

An estimated 140-200 million people live in or around forested areas. The "myth of the vast emptiness" is just that. At the same time, 230 million



people and a total of 3.5 billion hectares are threatened by desertification, with 21 million hectares reduced to a state of uselessness every year.

The consequences for people are both myriad and tragic. As the destruction of the natural world proceeds, the economic base declines. Food production for the indigenous population decreases with a concomitant rise in hunger and malnutrition. The increasing search for food and water falls heavily on women and children, with daily trips of six hours just to acquire water not uncommon. Women and children must also sell their labor in order to acquire the currency necessary to purchase food.

With the pressures of poverty becoming more prevalent, groups often choose to migrate to improve their situation. But the difficulty in adapting to the new environment often makes matters worse. Even in the midst of plentiful food supplies, people can starve: their intimate knowledge of their old milieu is useless in the new surroundings, and often the learning of necessary survival skills does not proceed rapidly enough.

In addition, encountering other groups already rooted in the new areas may result in cultural and more serious conflict. In the end, the spiral of worsening conditions may result in disruption of interpersonal relationships, total social disintegration, and even disappearance of entire indigenous groups.

It is in the area of health and disease

where the direct human costs of deforestation and desertification are most tangible and tragic. Of course, loss of food from the demise of agricultural systems contributes directly to malnutrition and hunger. But beyond that, the disruption of the ecological balance itself leads to increases in death and disease. Disappearance of predators leads to an increase in the disease-carrying rodent population. Decreases in bird and bat populations cause an increase in the numbers of disease-carrying insects. And even indirect phenomena can contribute to a change in vector status: vehicle tracks, ruts, and discarded tires provide pools of water that act as perfect breeding sites for whole populations of malaria-bearing mosquitoes.

It is clear that when ecological disruption occurs, vector ecology changes to favor the vectors. And when that happens, rates for diseases like leishmaniasis, Chagas's disease, malaria, scrub typhus, schistosomiasis, and trypanosomiasis go up. It only makes matters much worse that a population of individuals will be susceptible to any infectious disease to which those individuals have not been previously exposed. The failure of policy makers to understand and take into account the complexity of the natural world, in essence, is killing people.

These books, though they are short, do not duck the question of which policy makers have exacerbated the problem. At the same time, these reports do not offer a comprehensive analysis of how things developed the way they did. Third World countries themselves are the target of criticism: exploiting land for short-term gain, growing cash crops instead of food for the indigenous population, accumulating a crushing foreign debt—all of which feed back on one another to make the situation even worse.

The donor countries and agencies, like the World Bank, have also done their share by focusing on projects with narrow goals. They don't adequately fund programs based on ecologically sound land-use principles, frequently funding the wrong things. The infamous Indonesian Transmigration Program and the funding of pesticide and livestock imports—instead of supporting a regenerative agricultural system—are examples of poor funding choices.

Even the United Nations, if not by commission but by what it has failed to

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do, has contributed to the worsening of the ecological situation in Third World countries. For example, the U.N. Conference on Desertification's 1977 Plan of Action to Combat Desertification was the first international recognition of the problem. The plan recognized the need to address the socioeconomic causes of desertification and the necessity of a multiple and interdisciplinary approach to the problem. But ten years later—and with billions of dollars having already been spent—the situation is worse than ever. *The Encroaching Desert* provides an engaging discussion of the bureaucratic and political events which go a long way in explaining this dramatic failure at international cooperation.

The books do report on some success stories, like the efforts to save forests and combat desertification in China, Syria, Soviet Asia, and Niger. Also, there are recommendations for action, like total protection for exceptional areas and use of bilateral and multilateral aid (like the World Bank) to fund ecologically responsible projects. But there is no indication of how even these meager proposals would be implemented.

The problems of deforestation and desertification "must be solved at the local level, by people who understand them in detail, as they affect each community." Local involvement, local control, and the democratic empowerment of people where they are living may be the most sensible approach.

—Joseph Regna

Invisible Frontiers

The Race to Synthesize a Human Gene

by Stephen S. Hall

The Atlantic Monthly Press, 1987, \$19.95 cloth

Gosh, isn't science fun? Yes—but isn't it a bit dangerous sometimes? Heck, no! That's what Stephen Hall tries to document in this saga of the invention of human insulin. Hall follows the Harvard research group (founders of the biotech firm Biogen) and the University of California-San Francisco/City of Hope researchers (founders of Genentech) in their race to earn praise, recognition, collaboration with Eli Lilly, and an awful lot of money.

In an unusual achievement for an experienced science writer, Hall manages to make a relatively simple

idea—the use of weakened *E. coli* bacteria to "grow" insulin—into something utterly befuddling to the layman. But undoubtedly, this book will make many best-seller lists for its appeal to the crowds who like to read about money and science being made. They'll kick themselves for not buying biotech stock in '78.

In this case, it seems that the DNA-tampering done by these scientists caused no apparent harm. However, this book laughs off the warnings of the National Institutes of Health, Ruth Hubbard, and other concerned scientists as alarmist. Although it took a great deal of pressure to get any of the early insulin researchers to use high-security lab procedures, Hall seems to feel that they were able to police themselves and monitor any health and safety dangers.

The author rightly concludes that the biggest gain from this insulin experiment was increased public acceptance of biotechnology (gain, that is, for companies like Biogen and Genentech). A recent survey by the Office of Technology Assessment used the production of insulin for diabetics as its example to measure acceptance of biotechnology and found strong public support.

Much of this book is devoted to scientist-hero worshipping, and unquestioningly reports their lack of interest in the application of genetically engineered insulin (until, at the end of the story, they discover that it can make them rich). The proposed application and initial rationale for their research is to solve a future shortage of insulin, which they anticipated through a projected five percent yearly rise in diabetes and a decrease in bovine and porcine pancreases—the original source for insulin—as the U.S. population eats less meat. But even this rationale is illogical—the increase, which is *not* five percent for insulin-dependent diabetes, is caused primarily by the aging of the population and its ever-increasing obesity.

At the end of the book, disclaimers fly. Ten years later, human insulin is still more expensive than bovine or porcine—and there is no shortage of pigs in sight. People who develop allergies to animal insulin are often allergic to the engineered variety as well. So what was the real purpose for developing human insulin? To increase public acceptance of biotechnology, of course. And in Hall's estimation, that reason is good enough.

—Ellen Weinstock

progressives such as Margaret Sanger, by socialists and communists in Germany, and by communists in the Soviet Union during the 1920s.)

But this is the only evidence she presents for the social origins of *current* interest in genetics. While clearly one can cite scientists and others (as I have often done) who enthusiastically view the new developments in genetics as the harbinger of a new eugenics era, such citations do not prove that the origins of the current interest in the field lie with these sources.

I am working in the Genetic Screening Study Group of SftP. Most of the concerns that Hubbard raises about the new genetics and reproductive technologies are ones that we agree with and have raised in our writings and talks. However, again, the actual and potential problems that these new technologies are causing does not prove that they originated with these harmful purposes in mind.

What we need is a detailed analysis and a justification of the claims for social and economic roots of a particular scientific or technological development, not an automatic application of the "science under capitalism and patriarchy is always evil" dogma. There is also too much of a conspiratorial flavor to Hubbard's description of how certain technological developments arose. The truth is much more complex than this.

I agree with Hubbard that a major source of suffering and death from parasite diseases in Third World countries can be found in social conditions. But I strongly disagree that the only tack to take is social revolution and that vaccines will necessarily only make things worse. Would she have said the same thing about smallpox and polio vaccines? Also, I do believe that the World Health Organization is aiding in the development of vaccines (among other projects) with the intention of avoiding the kind of dependency of Third World countries that Hubbard rightly criticizes.

Why does it have to be all or nothing? We can fight for social change, pointing out the relationship of social and economic systems to disease and poverty, but at the same time develop medical interventions to improve the health of the living. I would suggest also that one of the major killers, malaria, will still be a problem even when social conditions change.

My concerns still stand. And I would suggest that while it would appear that the respondents present a similar response in criticizing my article, there are some serious underlying differences. There are many other points that deserve response, but perhaps it is better to let the debate be continued by others.



CENTRAL AMERICA

CONTINUED FROM PAGE 27

Honduran forests." The *contra* presence on their land has led some 450 families to relocate and colonize the Mosquitia rain forest, destroying some 40,000 hectares of forest in the process. And according to newspaper reports, the *contras* have set some 300 square kilometers of valuable forest ablaze.

In Guatemala, the armed forces have waged a scorched earth strategy, burning hundreds of villages and destroying crops, forests, and fields. "Half of the forests in Chichicastenango have been destroyed" in 1983, "depriving us of wood for cooking and destroying the natural resources which could help us to survive in the future," said one Indian witness. More than one million refugees have been created by this policy. Many relocate into rain forests, including the imperiled Lacandon forest in southern Mexico.

Recently the Guatemalan army has begun a controversial spraying campaign of paraquat, a deadly defoliant, in the lush Peten rain forest region. While the government claims use of the defoliant is to destroy marijuana cultivation, it is widely believed that the spraying is part of the counterinsurgency campaign in this area of guerrilla activity.

As noted Costa Rican environmentalist Gerardo Budowski told participants at the May environmental conference in Managua, "The search for environmentally sustainable development is the same as the search for peace." A network of nongovernmental organizations established by Budowski and others at the conference will coordinate the work of environmentalists throughout Central America—a gesture toward regional cooperation at a time when governments are deeply divided.

However, environmentalists in the U.S. have been slower to realize that war in Central America is an environmental issue. While the environmental movement has become a vocal opponent to the nuclear arms race, environmentalists are only just beginning to get involved in the effort to stop U.S. intervention in Central America. Nor has the anti-intervention movement reached out to their natural allies—environmentalists. Reflecting on a two-week tour through Honduras, Nicaragua, and Costa Rica as part of a delegation investigating environmental destruction there, Greenpeace USA executive director Steve Sawyer said, "It's about time that the U.S. environmental movement recognizes that it has a crucial role to play in resolving the Central American environmental crisis." 

MICROWAVES

CONTINUED FROM PAGE 23

operation of the base? But this may be an irrelevant distinction, because either way, if the government is using microwaves or other invisible means of security and control, it must be doing so intentionally and it must be aware of microwaves' potential for harm. (See the accompanying sidebar.)

Beyond this inclination to place fault lies the larger issue of exposure to unnatural forms and levels of electromagnetic radiation and the effects those exposures have on most of us in the industrialized world. Electromagnetic radiation is ubiquitous, from police radar and television transmitting towers to high-tension power lines, VHF radio antennae, and CB radios. For microwaves and radar specifically, the U.S. exposure limit of 10 milliwatts per cubic centimeter (1,000 times the Soviet Union's standard) was set not to ensure health and safety, but to allow the military high enough levels for virtually unrestricted use of microwaves and radio waves.

In addition to the symptoms experienced by the Greenham women, microwaves can also cause cataracts, miscarriages, birth defects, leukemia, hair loss, decreased life expectancy, anemia, tremors, diminished sexual vigor, loss of appetite, sweating, suppression of the immune system, polycythemia vera (a rare blood disorder), heat stroke, decreased sperm production, increased permeability of the blood-brain barrier, meningitis, and brain tumors. With many cases currently in litigation, 25 former U.S. military personnel have already been granted compensation for injuries suffered as a result of exposure to microwaves and radar.

NUCLEAR HEGEMONY VS. BRITISH SOVEREIGNTY

But the danger of microwave radiation to all people is not the only issue on which the Greenham women's struggle has focussed attention. Another is the sovereignty of Great Britain. With over 102 U.S. military bases in Great Britain, it is small wonder that the British often feel as if they're living in an occupied country.

Other irritants bolster this feeling. For example, U.S. soldiers have participated in the repression of the women's activities at Greenham Common: making arrests, using abusive language, and wielding batons to crush women's fingers as the latter tried to cut or unravel the fence. When some Greenham women asked a British soldier why he was guarding a foreign military power's nuclear weapons base on British soil, he replied, "To be honest with you, the sole reason we are

here is not to keep you from them, but more importantly to keep them from you."

In addition, people arrested on the grounds of U.S. bases are prosecuted for trespass under U.S. law, with stiffer penalties than exist under British law. The U.S., in the event of war, has the right to shoot anyone entering one of its bases without permission and would not be liable to the British people for any of its actions. As a draft U.S.-British Status of Forces Agreement states:

"Should the U.S. military commander consider that the U.K. government does not possess the capability of quelling disorders which may materially affect the mission or security of the U.S. forces effectively or in time, the U.S. forces may take such action as the U.S. military commander deems necessary, either unilaterally or in cooperation with the government...no civil action shall be brought in the courts against any member of the U.S. Forces....The authorities of the U.S. shall have the exclusive right to exercise criminal jurisdiction."

In the event of a crisis, 100,000 U.S. troops could pour into Britain, outnumbering British forces three to one. Civilians could be compelled to work in labor gangs and be at the disposal of the U.S. military. Up to 30 hospitals may be ordered to discharge all civilian patients to make way for U.S. military casualties, and even today, with the British health system in need of major renovation, the U.S. has decided to build 16 military hospitals for the exclusive use of Americans in Great Britain.

But then, Great Britain's sovereignty, most Greenham women would agree, is not the real issue either. The existence of nation states and the national security mentality that they engender is the underlying problem. It is in this context—the struggle against two occupying forces, their "own" government and that of the U.S.—that the efforts of the Greenham women and the British people take on their real significance.

Their struggle is unique to, and yet part of, the larger struggle for freedom, democracy, and people taking control of their own lives. With all of its technological arsenal, from photic drivers and squawk boxes to nuclear bombs and cruise missiles, the state is defenseless against the hope wielded by a people determined to resist.

"One can look at all this and feel that it's very, very depressing, but my feeling is that I believe that people are going to change it," says Simone Wilkinson, a longtime Greenham activist. "I believe it absolutely, and that's the strength that I found through being at Greenham." 

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