

SCIENCE FOR THE PEOPLE

Vol. 19 No. 1

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**Using Science
to Find Argentina's
DISAPPEARED**

HEALTH AND HUMAN RIGHTS

Three of the feature articles in this issue take us to two different hemispheres in search of health and human rights. Paul Epstein and Randall Packard have practiced medicine and performed research in Africa, catalyzing their analysis of ecology, immunology and the social context of AIDS in Africa. Nancy Krieger has studied the epidemiology of AIDS in Africa, and profiles the development of this epidemic. Barbara Beckwith interviewed several North American scientists who have worked with Argentinians using genetic screening and forensic science to find the living and identify those murdered by the juntas. Steffie Woolhandler and David Himmelstein, physicians who are working for a national health program, decry the injustice of profit-oriented medicine and advocate a more humane alternative. These articles each show how science can help solve problems that are political as well as medical.

Barbara Beckwith's cover story initiated our long-awaited writers' fund. It's the first "investigative" piece we've solicited for the magazine. With your support, and the donations needed to pay for research, interviews, and freelancers' hard work, there will be many more.

Here's what we're planning for the future: Science for the People's magazine committee is working on a proposal for a special issue on military funding of scientific research. We'll look at the trend in military funding since the Vietnam War, its impact on academic freedom, and the increasing incorporation of scientists into the military sphere. Which fields are affected, what projects are being supported, and how much money funds corporate versus government research? We'll focus on shifts in scientific research under the Reagan administration, scientists' responses and their growing opposition to the militarization of their work.

We're also planning a few special sections in upcoming issues. We'll be highlighting women, health, and technology with articles that report on the feminist health movement, international responses to new reproductive technologies, and DES's contribution to the social meaning of medical risk. In another issue, we'll feature reports from the Committee for Responsible Genetics's recent conference on creating a public agenda for biotechnology.

These ambitious plans will take more money, of course. If you're a subscriber to Science for the People, you probably received a fundraising letter in the last month or two, urging you to contribute to our publishing projects. Even though you can't deduct your nonprofit contributions unless you itemize your tax returns any more, it's not too late to help us out. National Public Radio reported that nonprofits will lose millions of dollars in donations revenue as a result of the new tax law. Much of that money will be lost because donors don't understand that their contributions can still be deducted if they itemize their returns. Please, don't let taxes scare you away from donating.

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Gary Keenan

Designer

David Gerratt

Cover

Amnesty International Photo

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Printing

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Central America Conference on Women in Science, Technology & Medicine in Developing Countries

Dear SftP:

On August 24-28, 1987, a conference in Managua, Nicaragua will discuss the experiences, prospects, and strategies of women in science in developing countries. The focus will be on women in Central America, but participants are invited from other parts of the world, particularly North America.

The conference is sponsored by the Kovalevskaia Fund (U.S.A.), which is financing the participation of women from Central America outside Nicaragua, and by the Confederacion Nacional de Profesionales in Nicaragua, which is hosting the conference. Unfortunately, neither organization can support the travel or expenses of people from outside Central America. However, inexpensive accommodations will be found in Managua for all registered participants.

The registration fee for participants from developed countries is \$50 in U.S. funds. Because of limitations on facilities and the necessity for advanced planning, please register as soon as possible, by January 15, 1987.

Following the conference, an optional tour of Nicaragua will be provided at a reasonable extra charge. The tour will last several days, and include visits to the university and medical school in Leon, laboratories, hospitals and production centers, as well as cultural and historical places of interest.

The main language of the conference will be Spanish. However, before each talk in Spanish or English an abstract will be posted in the other language. There will be a maximum of five papers presented by North Americans. For those wishing to present, send a CV and one paragraph abstract along with your registration. Papers should be suitable for a 20-minute presentation (5-10 pages), and should be received before June 30.

Send registrations with a \$50 check payable to the Kovalevskaia Fund to Prof. Ann Hibner Koblitz, Dept. of History, Wellesley College, Wellesley, MA 02181.

—Neil Koblitz
Berkeley, California

Industry Should Bear the Radiation Burden

Dear SftP:

I found your article, "Radiation Workers" (March/April 1986), well thought-out and comprehensive. Much of the article deals with allowable radiation dosage to workers and laws limiting the amount of radiation workers are allowed to receive. These are good laws that prevent any one worker from assuming an overwhelming risk. However, I believe that the laws serve companies' interests unless they are coupled with laws limiting radiation dosage over the total population of workers at a given enterprise.

The Hiroshima and Nagasaki studies have shown that the danger from radiation increases approximately linearly with the strength of the dosage. One hundred workers receiving one unit each of radiation will develop as many cases of cancer on the average as ten workers receiving ten units each. Thus, if an enterprise exposes a large number of workers (say 5,000) to a small dose of radiation (say 5 rems), it will kill roughly the same number (5,000 workers x 5 rems/worker x .1% deaths/worker per rem 25 deaths) as would be killed if a smaller number of workers (say 500) absorbed the total radiation burden (500 workers x 50 rems/worker x .1% deaths/worker per rem 25 deaths).

The deaths are covered up because each worker's experience does not differ greatly from the population at large. An individual's chance of contracting cancer from work under these circumstances is roughly the same as from nonwork causes. A worker cannot prove that his or her cancer was caused by work, unlike the cases of the radium workers of the 1930s.

I feel that we must push for laws that somehow hold industry accountable for the total radiation (and other carcinogen) burden absorbed by their workers, as

well as laws that limit the radiation burden assumed by any one worker. Industry has become more sophisticated. They have spread their deaths around (especially among Black and poor people, whose cancer rates are alarmingly higher than the rest of the population) so they become the norm rather than the occupational aberration of the past.

—Lee Kamensky
Jamaica Plain, Massachusetts

Chernobyl U.S.A.

Dear SftP:

I read with dismay, although by no means disbelief, in the Union of Concerned Scientists' *Nucleus* (Summer 1986) that the Perry, Ohio nuclear power plant, not far upwind from my home, has the same sort of containments as the Chernobyl plant.

Given the type of fairly slow-developing crisis in which government officials, who previously cooperated with industry in forcing these plants down our throats, now lie and minimize danger, it would seem very desirable for citizens' groups to set up their own warning systems with radiological monitoring equipment and secure, redundant communications systems manned at least partly by persons who have close relatives in the immediate downwind areas.

With a view to setting up such warning systems, may I request that scientists working with your organization specify what equipment would be needed, how it works, whether it is commercially available and at what prices, and that you publish information relevant to such nuclear power plant watch groups. It would also be desirable if you collected and published a list of antinuclear power groups located nearest to nuclear power plants, which would form a core group to work with in setting up such nuclear monitoring projects.

It is even possible that some start-up funding could be obtained by initially organizing this activity as an early warning system to banks, large corporations, hospitals, and wealthy professionals. However, I would be the last person to suggest that those large institutions which cooperated in forcing nuclear power plants down our throats or just stood around passively should get an especially early warning!

—Robert Cogan
Edinboro, Pennsylvania



REAGAN ADMINISTRATION VETOES RESEARCH

It should be no surprise to most SftP readers that the Reagan administration's agenda includes sabotaging government regulation of environmental and occupational health. But the extent to which the administration will go to achieve these goals can still be shocking.

Researchers at the federal Centers for Disease Control (CDC) have been complaining in the last few years that the White House Office of Management and Budget (OMB) has been arbitrarily delaying, altering, and rejecting research projects through its powers under the Paperwork Reduction Act. This act, whose purpose was to control the burden on U.S. citizens of the collection of information by various agencies, effectively gives OMB veto power over any scientific research projects, such as epidemiologic studies, that involve information collection from the public.

Rep. John Dingell's Congressional investigation of the complaints led to a study by consultants at the Harvard School of Public Health and the Mount Sinai School of Medicine, which found that OMB was indeed rejecting proposed studies for questionable reasons. The vetoed studies included an investigation of the effects of dioxin by monitoring the health of 360 workers exposed to dioxin at two chemical plants, and a study of stress-related illness and reproductive abnormalities through a prospective study of 2,000 women operating video display terminals.

Other rejected research involved studies concerning cancer rates in 500 chemical workers exposed to MBOCA (a potent animal carcinogen), stress in information processors, abnormal birth outcomes in CDC lab workers, and collecting the first scientific data on falls from ladders in workplaces.

All the rejected studies had been approved by a peer review process in which researchers in various fields critiqued the purposes and methodologies of the studies. They were rejected by OMB, however, for reasons that ranged from "design flaws" to "no practical utility." Three of the studies (dioxin, VDTs, and MBOCA) were subsequently approved after Congress investigated.

The Harvard consultants found that the

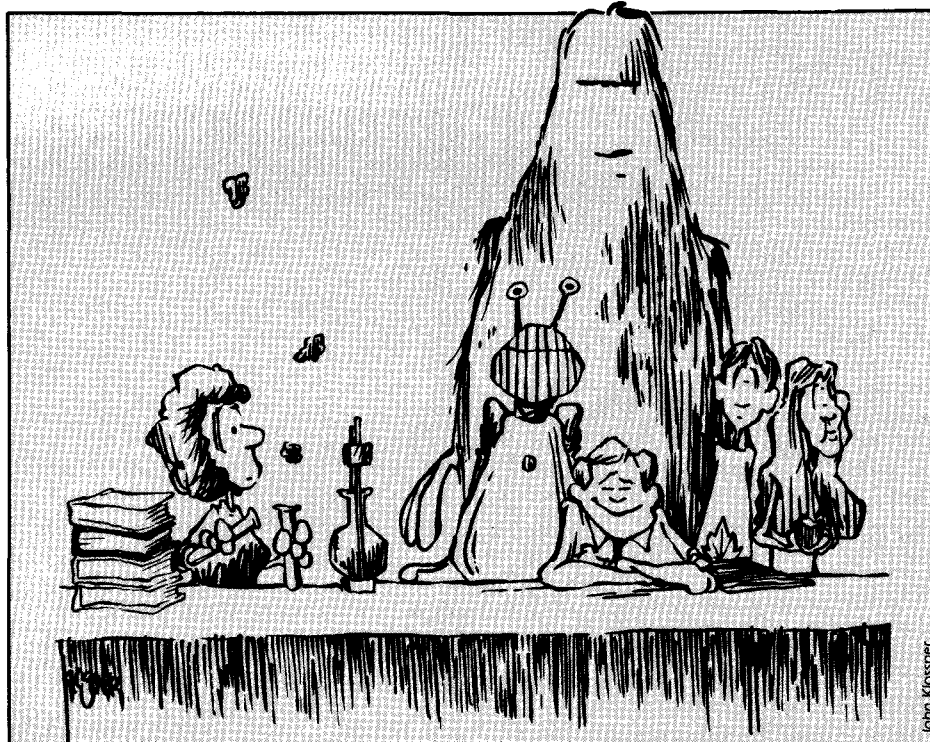
peer review process had been thorough, and felt that the studies were scientifically valid and useful. They characterized the OMB reasons for rejection as "inappropriate," and based on reports by consultants who were either unprepared or biased against the studies, and who were not public health professionals.

When the pattern of OMB rejections was studied, the consultants found that the OMB was seven times more likely to reject CDC studies involving environmental and occupational hazards than other epidemiologic studies (such as childhood immunization, hepatitis, malaria, and sudden infant death syndrome). This difference was statistically significant. Reproductive studies, focusing on such problems as birth defects and venereal disease, were also

frequently rejected.

Other possible reasons for the rejections, such as that all the environmental and occupational studies originated from the same office, or that they cost more, were considered and rejected. The report points out that the OMB may tend to reject studies of environmental and occupational hazards simply because the design of such studies is, in general, more difficult and controversial than more conventional epidemiologic studies. But the pattern they found also fits the Reagan administration's agenda of weakening regulation of such hazards. After all, if the government doesn't know the effects of a particular exposure, what basis does it have for regulation?

— Mike Wold



John Klossner

CREATIONISM IN COLLEGE

Are most U.S. college students creationists? A survey of 1,000 students aged 18 to 22 in California, Connecticut, and Texas found that more than half believe that God created Adam and Eve and that Noah's Ark existed. Those who claimed belief in creationism also tended to be more politically conservative, read fewer books, and didn't do as well in college exams as students who supported evolutionism.

"For a leading scientific nation, this is not a good sign of the effectiveness of our science education," said Francis Harrold, professor of archaeology at the University of Texas at Arlington, who helped conduct the survey. Harrold said that high school science teaching should be strengthened to combat the trend towards creationism.

In addition to majority support for creationism, the survey found that one-third of the students polled also believed in the existence of Big Foot (a hairy humanoid reported to live in the mountains of the Pacific Northwest), the drowned city of Atlantis, aliens, and ghosts.

— information from *New Scientist*

Science Teaching in Nicaragua

Teach science or math at the university level for one or two semesters. Must be able to teach in Spanish. Other projects include sending reference materials and technical journals to university libraries, participating in research projects, and teaching shorter seminars. Send curriculum vitae and description of teaching experience and courses you could teach to:

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PHYSICIAN, DON'T HEAL THYSELF

The British Medical Association is taking on a task that the British government has refused to shoulder—deciding who should live and who should

die following a nuclear war.

Dr. John Dawson, head of the BMA's scientific division, has announced that an expert group will be releasing a report sometime in 1987 specifying how doctors should choose those deserving medical treatment from among the millions of casualties of a nuclear war. Speaking to a European symposium of International Physicians for the Prevention of Nuclear War in Madrid, Dawson said that

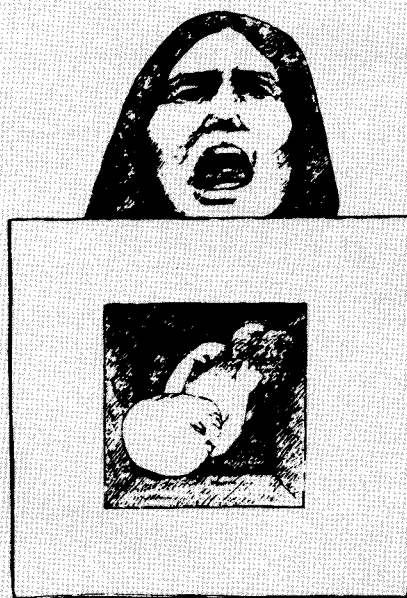
FETAL LEGAL RIGHTS

New developments in reproductive technologies may favor fetal rights over women's rights. Two recent developments—a pioneering operation on a fetus and a court indictment of a woman charged with abusing her fetus—fringe on the right of a pregnant woman to choose what happens to her body. Historically, the medical profession has treated the woman as the patient, but that precedent is being reversed as fetuses are now being treated as patients separate from the pregnant woman.

In San Francisco, Michael Harrison performed a successful operation on a 23-week-old fetus to correct a normally fatal condition, hydronephrosis, which causes urine to back up into the kidneys instead of draining into the amniotic sac to form amniotic fluid. Without amniotic fluid, a fetus's lungs do not develop. The operation involved cutting through a woman's uterus and amniotic sac to remove the lower half of the fetus out of the womb, cutting a hole to drain the bladder out through the fetus's abdomen, and stitching a flap of the bladder to the abdomen before returning the fetus to the womb.

The baby was later delivered by caesarian section, and is the first to undergo anatomical fetal surgery and survive. Two previous but unsuccessful fetal operations were performed by Dr. Harrison. His team will soon treat two other conditions, herniated diaphragm and hydrocephalus, with fetal surgery.

When faced with the knowledge that her fetus is suffering a condition which may be cured with these new medical treatments, health professionals expect that most women will choose to accept the risk of rupturing their uterus in current or future pregnancies and undergoing multiple caesarian operations. But when a woman refuses such treatment, legal intervention will be likely. "The more medicine can do



for the fetus, the more pressure will be brought to bear on the woman," states attorney Lawrence Nelson, who specializes in medical ethics.

The case of a woman from El Cajon, California who is facing charges of abusing her fetus makes this more than a hypothetical argument. She is accused of causing the death of her month-old son by taking drugs and ignoring medical advice during her pregnancy. She was experiencing placenta previa, a condition that can threaten the life of a fetus and mother.

Prosecutors in the San Diego district attorney's office claim that Pamela Rae Stewart ignored medical advice to stay off her feet, refrain from sexual intercourse, and avoid drugs. Her baby was born with severe brain damage and had traces of amphetamines in his system. Although murder charges were considered, she faces a lesser charge which, if convicted, carries a punishment of a year in jail or \$2,000 fine. Ms. Stewart is said to be "psychologically devastated" and awaiting trial in jail because she can't raise \$2,500 bail.

—Leslie Fraser
information from *New Scientist*

treatment would be denied to anyone unable to contribute to the survival and regeneration of the community. Food producers, mechanics, and nurses would be among those chosen for survival.

The British physicians' realism in assessing the aftermath of a nuclear holocaust is refreshing. Dawson pointed out that physicians probably wouldn't be included among those who would merit treatment because they would not contribute to the survival of the community. Doctors, he pointed out, tend to know little about first-aid and be helpless without their equipment.

The new study follows in the tradition of a BMA survey on the medical effects of nuclear war, which embarrassed the British government not long ago. That study concluded that half of the British population—26 million people—would be killed in a full-scale nuclear attack, rather than the 16 million estimated by the British Home Office.

—Stephanie Pollack
information from *Manchester Guardian Weekly*

CRIMINAL EXPOSURES

At least some officials in the U.S. think that exposing workers to toxic hazards is a crime. The District Attorney of Brooklyn, New York has charged two executives and a foreman of Pymm Thermometer Corporation with criminal assault for their roles in exposing workers to mercury. The indictments followed four years of Occupational Safety and Health Administration inaction at the plant and a year-long investigation of the factory by the Brooklyn D.A. and the New York Attorney General.

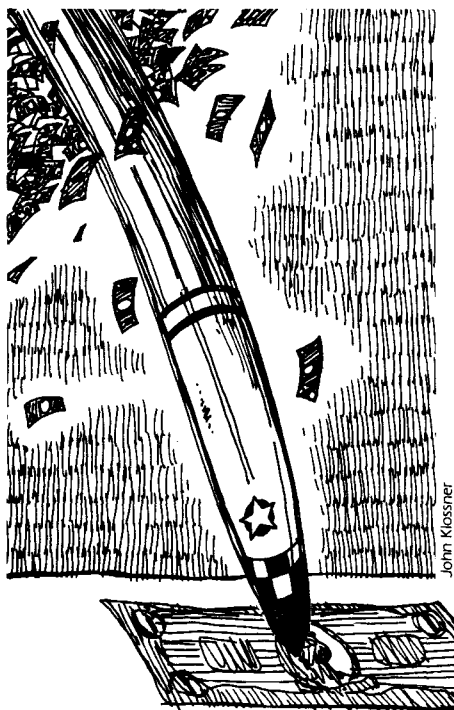
Vidal Rodriguez, one of the Pymm workers, apparently suffered permanent brain damage after working for almost a year crushing broken thermometers in a windowless cellar in the factory. Other workers were also exposed in the secret operation, leading to the reckless endangerment count. Mercury can damage the brain, liver, kidneys, and lungs, as well as cause birth defects.

All of the defendants pleaded not guilty to the charges. According to their attorney, "No employee was asked to do anything that the Pymms (president and vice president of the company) wouldn't or didn't do themselves."

Regional OSHA officials apparently knew of the problems in the plant as long as five years ago, but accepted Pymm's promises to clean things up. After New York State officials complained about the lack of enforcement, the national OSHA office investigated and issued 16 citations against the plant. Pymm recently agreed to pay a miniscule \$21,000 penalty to OSHA and to correct the violations.

"The defendants in this precedent-setting case are accused of sacrificing worker safety for greed," said Brooklyn D.A. Elizabeth Holtzman. "A chemical assault on a worker is just as serious as a physical assault on the street. The weapon here was a dangerous chemical, and it inflicted just as much damage as a gun or knife."

—information from *Occupational Safety & Health Reporter*



STAR WARS LOSING THE BATTLE FOR SCIENTIFIC ACCEPTANCE

Scientific opposition to Star Wars continues to grow. By a margin of more than eight to one, National Academy of Sciences members in the physical, mathematical, and engineering

sciences oppose President Reagan's Strategic Defense Initiative. Respondents to a survey conducted by the Cornell Institute for Social and Economic Research criticized Star Wars as "costly, dangerous, and a scientific fraud" and "an unprecedented hoax being presented to the American people."

Seventy-one percent of NAS members responded to the survey. Almost all of them believe that Star Wars won't work. Ninety-eight percent of the respondents felt that antimissile efforts couldn't destroy enough incoming missiles to provide "an effective defense of the U.S. civilian population" if the Soviets tried to counter the defensive system. Ninety-four percent thought no such defense would be possible even if the U.S.S.R. made no changes in its current offensive missile system.

Star Wars not only endangers world peace, the scientists concluded, but also threatens to break the federal budget. Sixty percent of the NAS members surveyed said that the SDI research budget should be \$1.5 billion per year or less, with only seven percent advocating funding at or above the current level of \$3.5 billion annually. As one respondent noted, "Continuing on this course will either lead to a catastrophic nuclear war or total bankruptcy."

These survey findings are consistent with other indications of scientific disenchantment with Star Wars. As of July, according to the *Wall Street Journal*, more than 1,600 scientists and engineers from almost 100 government and industrial laboratories had petitioned Congress for curbs on Star Wars funding. Even closer to home, 3,700 science and engineering professors and senior researchers, including over half of the faculty members in the nation's top 20 physics departments, had pledged not to accept Star Wars research funds. If this trend continues, the Reagan administration may one day be forced to complain that it gave a Star Wars and nobody came.

—Stephanie Pollack

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SCIENCE FOR HUMAN RIGHTS

Using Genetic Screening and Forensic Science to Find Argentina's Disappeared



Photo/Carrion/Sigma

BY BARBARA BECKWITH

Over the course of Argentina's eight-year military rule, the word "disappeared" took on a new and sinister meaning. It came to mean abducted, tortured, murdered, and most probably buried anonymously in a secret mass grave.

Between 1976 and 1983, a series of military juntas ruled the country, with Army and Air Force generals proclaiming

Barbara Beckwith is a freelance writer and former member of SftP's Sociobiology Study Group.

themselves president. The most recent junta's failed attempt to take over the Falkland Islands from Great Britain forced the junta to resign. Civilian government was restored, and democratic elections voted President Raul Alfonsin into power.

It is estimated that from 9,000 to 25,000 Argentines disappeared from sight during the juntas' reign. Some were thrown out of planes into the sea and may never be found—an occasional body washes up on Uruguayan beaches. An unknown number may have escaped to other countries. But it is now clear that the largest number of the missing Argentines were systematically tortured and murdered

by the Argentinian military in one of the worst cases of human rights abuses in history.

"First we will kill the subversives," one police official announced openly during those dark years. "Then we will kill their collaborators, then their sympathizers, then those who remain indifferent. And then we will kill the timid."

Between 200 and 400 children are included in the list of "disappeared"—some murdered, some abducted, but most born in prison. The military followed a rule: to wait to kill a pregnant woman prisoner until after she gave birth—but the rule didn't apply to torture. The newborn

children were then sold on the black market, given to adoption agencies, or taken as "war booty" into military families.

"Subversive parents teach their children subversion; this has to be stopped," explained former Buenos Aires police chief General Ramon Campos in a 1984 interview, recalling how he took children from their parents to give to adoption agencies. Campos is currently in preventive detention on human rights charges.

During the military era, forensic and medical doctors were ordered by the military to falsify birth, medical, and death records to cover up torture, killings, and illegal adoptions of children. Nursing personnel who notified relatives of prison births were at times "disappeared" as well.

Since late 1983, the killing has stopped; democracy is now restored in Argentina. But for the families of the disappeared, the suffering continues: the pain of not being able to bury your child's body, not knowing if your grandchildren are dead or alive, and realizing that your child's torturers and murderers are still at large. Many military officers from the former regime remain in their posts, even those scheduled for prosecution.

Members of the Mothers of the Plaza de Mayo (Madres), a human rights group composed of relatives of the disappeared, continue to demonstrate at the Plaza de Mayo in Buenos Aires every Thursday, as they have since 1977, calling for the return of their children, dead or alive. With them march the Grandmothers of the Plaza de Mayo, demanding the identification and return of their kidnapped grandchildren.

The Grandmothers (Abuelas) have spent years trying to track down their missing grandchildren. Using techniques worthy of the best detectives, they scrutinized hospital records for falsified birth certificates, pored over adoption papers, and even posed as maids in military families to gather information on children living in those homes. Of 200 children listed as missing, the Abuelas have now located 39. Four were dead, but the rest are still alive.

But to gain legal custody of children they are convinced are their grandchildren, the Abuelas need more than records and eyewitness accounts. They need concrete evidence of a biological link between themselves and children living with adopted families.

The Grandmothers had a hunch that genetics might be the answer. None of them were scientists, but they were intelligent people. They knew about paternity testing; they knew blood tests could prove that a particular set of adults must be the parents of a particular child. But in most cases with which the Abuelas were dealing, both parents had been "disappeared." How could testing prove a familial link if only the grandparents were living, if the intervening generation were

missing? They wondered if genetics might help.

The Investigation Begins

In 1984, two Grandmothers flew to New York City to hear a scientific presentation concerning a purely theoretical formula for determining grandpaternity based on genetic variation in blood samples. They then went on to Washington to talk with Eric Stover of the Committee on Freedom and Responsibility of the American Association for the Advancement of Science (AAAS). They had one question: was it possible to use genetics to match up relatives two generations apart?

In May 1984, Mary Claire King, professor of epidemiology at the University of California's School of Public Health in Berkeley, got a call from Stover asking if she knew the answer to the Abuelas' question. Yes, she said, a genetic grandpaternity test should work—in theory at least. A month later, King was on her way to Buenos Aires to turn theory into fact.

In part, King was motivated by having a daughter the same age as those the Grandmothers were trying to identify. "If I had been born in Buenos Aires, not in Chicago, I probably would have been one of them, and my daughter would have been kidnapped," says King.

Also on the June trip to Buenos Aires were Stover, geneticist Cristian Orrego, and four forensic specialists, including Clyde Snow (who helped identify the remains of the infamous Nazi doctor Josef Mengele), and Luke Tedeschi, Director of Laboratories at Framingham Union Hospital in Massachusetts. The forensic team went to use their skills to identify skeletons from mass graves of the disappeared, while King worked out methods for identifying their children.

They traveled to Argentina under unprecedented circumstances. Democracy had only been restored for seven months. Already, a National Committee on the Disappearance of Persons (CONADAP) had begun hearing citizens' testimony on 8,800 illegal abductions. Each locality had its own commission gathering data, and human rights groups were actively involved. The AAAS delegation had been invited by human rights groups (including the Grandmothers), CONADAP, and President Alfonsín.

"In the past, human rights expeditions were clandestine," says Tedeschi. "This was the first time a human rights investigation was given carte blanche."

Once in Argentina, King, determined to help Argentinians work out grandpaternity testing rather than doing the testing for them, looked for a laboratory equipped to do genetics. The Mothers rejected one private laboratory because of connections between its staff and the military, the very people responsible for the disappearances. Instead, they sent King to Ana Maria Di Lonardo's laboratory in Durand Hospital, a general

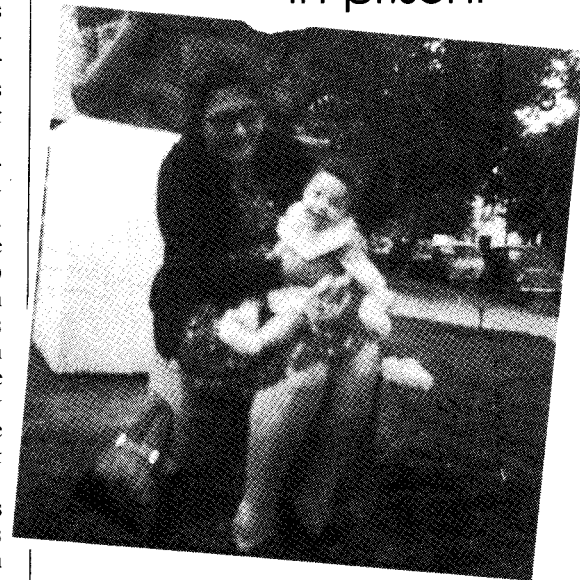
hospital severely neglected by the former military government.

"The place was falling apart—corridors were propped up with wood," recalls King. "But here was this terrific modern immunology lab—very democratic, very interactive—doing genetic marker paternity testing." Many of the researchers working in Di Lonardo's lab had lost relatives and friends during the military regime and were eager to help locate the disappeared.

King spent that day explaining the grandpaternity testing theory to the research group—"They grasped the basic principle in five minutes, and got ahead of me very fast. Soon I was handing the chalk over to them."

Having taught in Latin America, King supposed that getting the grandpaternity

Between 200 and 400 children are included in the list of "disappeared"—some murdered, some abducted, but most born in prison.



Elsa Pavon with her granddaughter, Paula, before she "disappeared."

research project going would be a long, involved process. Instead, the Durand researchers told her, "This afternoon, we'll draw blood from Elsa Pavon (a claimant grandmother) and then we have a court order to draw blood from Paula (a girl living as the natural child of a police officer). We can work in two shifts."

The next morning at 9 AM, the results were in. The data for Elsa Pavon and Paula showed a 99.9 percent probability of grandmaternity. "We didn't realize ourselves how powerful the testing could be," King recalls.

A year later, after court proceedings including testimony by the lab group, Paula was legally removed from the home of officer Ruben Lavallen and returned to Pavon, who the court ruled was Paula's natural grandparent. Lavallen and a physician are being prosecuted for birth certificate forgery.

Paula is the first of 20 children of disappeared Argentines whose identity has been determined in court on the basis, in part, of genetic tests, as well as evidence and eyewitness accounts produced by the Grandmothers.

From Genetic Markers to Grandpaternity

In effect, the Di Lonardo-King collaboration has extended paternity testing one generation further. In paternity disputes, the blood of a child and that of the man claimed to be the child's father can be compared. If a relatively rare combination of genetically determined elements is present in both samples, the people in question are most probably father and child.

Grandchildren, however, share only one-fourth of their genetic makeup with their grandparents. But if enough "genetic markers" can be found in the blood of both the child and the petitioning adults, the probability rates will still be high enough to show that the child and adult must be grandchild and grandparent.

The genetic markers used include five blood groups, fifteen different red cell enzymes, and HLA (proteins on the surface of white blood cells which vary significantly between individuals). At the University of California School of Public Health in Berkeley, Cristian Orrego is currently working out procedures for using DNA polymorphisms—sites on the DNA where significant variation can be found among humans—as another type of marker.

Factoring in the known distribution of various markers in the Argentinian population, an "index of grandpaternity" can be figured mathematically. The result has been the establishment of high probabilities—up to 99.9 percent—that shared genetic markers are the result of familial biology, not random chance. All data is tested "blind" to preclude researcher bias.

Figuring an index of grandpaternity in cases where both grandparents are dead is also possible. The Durand lab would first reconstruct the genetic makeup of grandparents from blood samples taken from aunts and uncles, and then work

backward to connect the grandparents' and the grandchild's genetic makeup. The genetic approach proved powerful even if one or both grandparents had died.

Ironically, genetic testing works both ways. In some instances, it proved that there was no biological relationship between a suspected abducted child and the claimed grandparents.

As grandparents of the missing children of the disappeared grow old and die, identification of disappeared children becomes more difficult. A National Bank of Genetic Data is now being set up to test and keep blood samples of relatives of missing children, so that the chance will remain that their grandchildren can eventually be located and genetically identified.

The gene bank has now tested blood samples of 250 people from 40 to 50 families of the disappeared and their children. "If in the future a child grows up and finds he was kidnapped as a child, he can find out who he is," says King.

The gene bank will also keep computer disk copies in an unnamed country outside Argentina to preserve all data in case of a coup. "Argentina is still a very fragile democracy," says King. "But every time I go there, it is stronger—it has broad support." Still, Di Lonardo's researchers are putting themselves at risk. "If there were a military coup, they would be in terrific danger," King notes.

Although the Grandmothers spent nearly a decade tracking down disappeared grandchildren, they haven't insisted that every identified child be automatically returned to the natural grandparents. When the adopting families were unconnected to the military and had adopted children in good faith, the Grandmothers asked only that the children be able to visit their real relatives on a regular basis, be allowed to use their own names, and be told their true identity.

Half of the cases of identified children of the disappeared, in fact, were resolved between the families themselves. But when military officers implicated in torture and

murder of the disappeared were involved, the Grandmothers insisted that the children be returned to their biological relatives, arguing that a kidnapper, if discovered many years later, would never be allowed to keep the child he abducted.

Bones Tell Their Story

The forensic part of the U.S.-Argentinian collaboration set up in June 1984 has succeeded in identifying a number of the disappeared from skeletal remains. Almost 300 skeletons have now been unearthed and are being studied by teams trained by U.S. forensic specialists. Clyde Snow is currently spending a year in Argentina working on the identification process. Each exhumation lasts eight hours, using archeological methods normally employed to study fossils.

Forensic identification of Argentinian disappeared is complicated by "the diabolical way the military eliminated people," according to Luke Tedeschi. "They would pick up people in one town, detain them in another, torture and kill them, then take them to another locale where they were dumped in mass graves with hundreds of others and intermingled with paupers." In addition, some bodies were partly dismembered to prevent identification.

"But bones have a story to tell," says Tedeschi. "Time is not a factor." The forensic teams have proven and testified in court that most of the dead died not in shootouts with police, as claimed, but from single gunshots to the head at short range, execution-style. Each identified skeleton helped make a case against military officers on trial.

For families of the disappeared, however, the forensic work took on more personal meaning. Tedeschi, an Amnesty International activist for 15 years, remembers the first public forum in Argentina at which the forensic team explained what they thought they could do.

A man named Lanuscou spoke up,





Dr. Clyde Snow, U.S. forensic anthropologist, trains workers in identifying Argentina's dead.

asking, "Do babies' bones disappear?" It turned out that his son, daughter-in-law, and children aged 6 years, 5 years, and 6 months were murdered in their home in 1976 and then buried in a common grave. All were recorded as killed in combat with military police. When the remains were dug up in 1984, Lanuscou found four bodies, but in the smallest box he found only a pacifier, diapers, and a teddy bear.

Dismissing his questions about the whereabouts of his youngest grandchild's remains, the coroner told him that "babies' bones disintegrate." That was his question to the forensic team: do a baby's bones disintegrate? On hearing that they do not, Lanuscou burst out crying, saying, "Then my granddaughter is still alive!"

The complicit role that Argentinian forensic specialists played during the military regime made setting up a U.S.-Argentinian forensic team difficult at first. Finding Argentinian forensic specialists to work with proved impossible, says

Tedeschi. "Most forensic pathologists had been in office during the military regime and had been involved. We didn't find any we felt comfortable with."

During military rule, pathologists routinely forged records on cause of death. Instead, the team looked to young graduate and doctoral students in human rights groups who wanted those involved brought to trial. "A core of them wanted the world to know what happened here," says Tedeschi. "They told one story after another of people with really little political affiliation disappearing, one after another."

After each exhumation, the teams washed and then reconstructed each skeleton, consisting of 206 bones and 32 teeth. They would then determine height, sex, age, stature, race, and right- or left-handedness. Medical records, including x-rays and dental charts, helped to identify who the person was. Forensic techniques could pinpoint torture-related trauma and cause of death.

The military waited to kill a pregnant woman until after she gave birth—but this rule didn't apply to torture. The newborn children were then sold on the black market, given to adoption agencies, or taken as "war booty" into military families.

Again, it was the young Argentinian trainees who took the greatest risk. "The military were all around," said Tedeschi. "We could see that the officers we talked to knew what was going on and had participated in it. You could sense if they were pushed too far, there would be big trouble."

In the end, both genetic and forensic techniques served not only to identify the disappeared and their children, but also combined with eyewitness accounts and evidence gathered by the Madres and Abuelas to bring their torturers and murderers to justice. So far, the top nine military officers have been prosecuted. About 1,700 cases against lower-ranking officers are pending.

Human Rights Precedent

Argentina has set a precedent in pursuing those guilty of human rights violations, asking for outside expertise, accepting in-court genetic and forensic evidence, and pursuing the torturers and murderers of the disappeared. "People who engage in torture can now be told, 'We can prove it,'" says Tedeschi. No matter how many years pass, government agents and military officers who murder innocent civilians can be tracked down. This could cause torturers to have second thoughts in the future, knowing that they can eventually be

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ECOLOGY & IMMUNOLOGY

BY PAUL EPSTEIN
AND RANDALL PACKARD

Though AIDS has been reported in 180 countries on five continents,¹ several recent papers have suggested that AIDS "originated" in Africa. According to the Centers for Disease Control, the "AIDS viruses" have been detected in 25 African nations. In 1981 and 1982, the high incidence in Africa of Kaposi's sarcoma, a tumor found in AIDS victims, spawned speculation that AIDS may have first appeared in the sub-Saharan region of Africa.² More recently, viral studies give some support to these early speculations.³

If AIDS did first appear in Africa or elsewhere in the underdeveloped world, what factors may have led to this emergence? To date, research on this question has been extremely limited, focusing primarily on the problem of identifying probable causative viral agents. Yet the natural histories of diseases may involve changes in the host and the environment (which may include a vector), as well as changes in the agent.

To understand these changes and construct a more complete set of the cofactors "causing" the AIDS pandemic, one has to look at the wider spectrum of contemporary diseases, as well as the larger social, economic, and cultural context. Disease patterns, nutritional changes, and historically developed social patterns have certainly played a part in shaping the transmission of AIDS in Africa. A deeper look suggests that they may have contributed to its "origins" as well.

We hope to broaden the current focus of research on this disease, which now threatens humankind. Some of the hypotheses which follow are of necessity speculative. Given the magnitude of uncertainty surrounding this threat, some

Paul Epstein is a physician with a masters in public health who works at Cambridge Hospital, which is affiliated with Harvard Medical School. He has lived and practiced medicine in Africa.

Randall Packard has conducted research in Africa. He teaches in the history department at Tufts University.

The photos in the following two articles are candid snapshots of West Africans, not African AIDS victims.

hypotheses are drawn from analogy with other diseases.

Disease and Population Changes in Africa

The study of disease in Africa provides insight into the nature of the interactions among environment, host, and agent. In precolonial Africa, many macro- and

The Social Context of AIDS in Africa

microorganisms existed with humans and other primates in a range of biological associations. These constituted a vast spectrum ranging from destructive pathology to lasting cellular and organismic relationships based upon interdependence and symbiosis.⁴ Cooperation may have played as large a part as Darwin ascribes to competition.⁵

Over thousands of years, disruptions in the established relationships were undoubtedly induced by calamities and population shifts. But in order to survive, parasites or disease agents achieved a balance in a steady environment. And in general, they did not eliminate their hosts, lest they themselves become extinct.

The opening up of West Africa to the European maritime trade in the late 15th century and the subsequent gradual expansion of European involvement in Africa profoundly altered disease patterns. Large societal shifts contributed to changes in entire ecosystems and in human/pathogen relationships.

Contact with European traders, administrators, and settlers exposed Africans to diseases with which they had little or no prior experience. While the limited existence of historical contacts between African and Eurasian populations prior to the 15th century meant that these diseases took a somewhat lower

toll among Africans than among the more isolated Native American populations of the New World, the results were sometimes catastrophic.

Measles, smallpox, cholera, influenza, and tuberculosis decimated many African communities.⁶ Communities such as the Khoikhoi of South Africa were devastated by repeated epidemics of smallpox during the 18th century.⁷ The slave trade itself had far-reaching economic and social effects. In 19th century Portuguese East Africa, "fields were ravaged, entire villages destroyed, and survivors often compelled to flee to inaccessible, unproductive locations to avoid slave traders."⁸

At the same time, early European travelers and merchants in Africa were exposed to pathogens such as the yellow fever virus and the falciparum malaria protozoa, to which they had little or no prior immunity. As a consequence, Europeans also died in large numbers during the period of early contact with African populations. The yearly mortality rate for Europeans working on the West African coast at the beginning of the 19th century was between 250 and 750 per thousand people. It was this experience with the "white man's grave," as West Africa came to be called, which created the perception of Africa as a "dark" and "disease-ridden" continent.⁹

While European explorations and trading activities occurred in Africa from the end of the 15th century, it was not until after the 1884 Berlin Conference (in which Africa was partitioned by the European powers) that full penetration of the continent occurred.

During the 1890s, colonial military expeditions in East Africa brought dislocations, famine, and diseases such as smallpox, whooping cough, influenza, and polio. The period that followed, and particularly the years between 1880 and 1930, has been described as probably the "most unhealthy period in African history."¹⁰

Malaria in Africa

The story of malaria in Africa illustrates the impact which European penetration and colonization had on the balance between people and disease in Africa. In the areas of West and Central Africa, where African populations are exposed to repeated malaria infections throughout the year, an inherited immunity had developed from the positive selection of humans with the three most prevalent genetically determined conditions in humans: sickle



cell trait, the thalassemia syndromes, and glucose 6-phosphate dehydrogenase deficiency.¹¹

The first two conditions can be pathological in the homozygous state, yet humans who exhibit the heterozygous state of hemoglobin alterations or the enzyme deficiency are more resistant to malaria infections and survive in greater numbers than those who do not. In effect, these red cell adaptations, along with the absence of Duffy factors in West Africa, have provided African populations with a degree of natural immunity to malaria. This contributed to a relatively nonlethal steady state in which the host experienced the disease but seldom died from it.¹²

In other areas of eastern and southern Africa, where malaria is a seasonal disease, infected populations apparently did not develop these genetic adaptations, because malaria was less of a threat to human life than the red cell alterations. Populations in these areas, however, did develop an "acquired" immunity to malaria through repeated exposure. This immunity was not permanent and could be reduced or eliminated by interruption of malaria transmission for two or three years.

Thus today, African children provided with chemo-prophylaxis suffer high rates of cerebral malaria when medication is stopped. Additionally, students from malarious areas of southern Africa who go overseas for academic training often suffer severe cases of malaria on their return home, if they do not take appropriate prophylactic measures. Where transmission is steady, however, people slowly develop some resistance to the disease from years of successful exposure, so that adults have in the past experienced only mild symptoms from infection.¹³

In addition to these biological adaptations, African populations developed cultural patterns which reduced exposure to the mosquito vector in areas where malaria was known to be prevalent. For example, prior to European settlement the Swazi avoided travelling in the lowveld areas of Swaziland during the rainy season. In short, Africans developed a variety of biological and cultural defenses to malaria over centuries of exposure to the disease.

Today, despite these adaptations and massive efforts to combat the disease, malaria has become a major cause of morbidity and mortality in Africa. Patterns of colonial and post-colonial development have disrupted ecological relationships and disturbed the balance between hosts and pathogens. Under pressure for development, for example, the forest areas of West Africa (which had been free of two major malaria vectors, the *Anopheles funestus* and *Anopheles gambiae* mosquitoes), were opened up to settlement. The development of cocoa farms, logging, food production, roads, and railways all created mosquito breeding sites and increased transmission of malaria.¹⁴



Photo/Harriet Carter

Similarly, in East Africa, the expansion of irrigation rice growing in western Kenya contributed to a major increase in malaria transmission.¹⁵ In Swaziland, the altered agricultural patterns, combined with the increases in human and cattle populations during the colonial period, forced the Swazi to expand their herding and agricultural activities into the lowveld areas, thus exposing themselves to infection. The subsequent development of large-scale irrigation agriculture in the lowveld both encouraged this settlement pattern and increased vector breeding areas.

Furthermore, colonial policies which were designed primarily to serve the labor needs of local white farmers and the South African mining industry impoverished rural areas in Swaziland and led to a decline in the nutritional state of many Swazi families. Famines were often followed by major outbreaks of malaria which took a high toll among children under the age of ten.¹⁶

Paradoxically, malaria itself had once been a major impediment to European penetration of Africa (part of Africa's defense system, if you will). In southern Africa, for example, the Afrikaner population, fleeing in Great Treks from the British (who were seeking to establish control from Capetown to Cairo) reached today's Maputo province of Mozambique and the community was eliminated by malaria.

Working in India and then in West Africa, Ronald Ross first "identified" the mosquito as the vector for malaria;¹⁷ thereafter Europeans moved their compounds to higher grounds. Avoiding interaction "for health reasons" encouraged segregated living policies and "separate development" (known as apartheid in South Africa) which ultimately led to increased exploration and settlement in the African interior.

The upsurge of malaria has in turn contributed to other health problems in Africa. Acute and chronic malaria infections produce depression of host immunity,¹⁸ with

infections by multiple species impairing immunity more severely than unispecific infections.¹⁹ Burkitt first identified malaria as a probable cofactor contributing to the virulence of B-cell lymphomas.²⁰ Malaria may also reduce host resistance to tuberculosis.²¹ Finally, malaria is under investigation as a possible cofactor contributing to the virulence of the T-cell tropic set of viruses implicated in AIDS today.²²

Increasing the Disease Burden

Colonial and post-colonial patterns of development which disrupted ecological and host/pathogen relations have contributed to other health problems in Africa. The development of irrigation agriculture helped spread schistosomiasis in western, eastern, and southern Africa.²³ Changes in land and labor use, together with restrictions on hunting, contributed to the expansion of bush areas and wildlife populations and to an increase in human/tsetse fly contact in much of sub-Saharan Africa. This, in turn, has led to the spread of African trypanosomiasis (sleeping sickness).²⁴

Urbanization has contributed to the spread of measles²⁵ and many other infectious diseases, some of which are themselves immune suppressors. A comprehensive review entitled "Microbial Synergism in Human Infections" describes the scope of these interactions.²⁶

While some infections directly inhibit host immunity, others facilitate colonization or provide essential growth elements for secondary pathogens. Still another group, such as bacteriophage viruses in diphtheria bacteria, increase the virulence or toxin production of others.

Acute infections such as influenza, measles, and pertussis temporarily lower cell immunity. This can have grave consequences. During epidemic measles, for example, an inordinately high incidence of primary and reactivation tuberculosis have been observed. Measles infection, with or without malnutrition, produces microscopic alterations in the thymus gland and changes in immune function.²⁷

Chronic diseases such as syphilis, trypanosomiasis, and viruses such as the Epstein-Barr (which often becomes latent) can lead to long-term suppression of immune mechanisms.

Concurrent immune suppression with malnutrition or coincident infectious disease may allow latency or long-term sequestration of infectious agents. This may have prolonged effects on the immune system. It may also allow for an increased number of mutations, which a suppressed host has a lower chance of recognizing as foreign and eliminating.

Nutritional Changes

"The commonest cause of T-cell immunodeficiency worldwide is protein-

calorie malnutrition."²⁸ Malnourished children have defects in macrophage and T-cell function, accompanied by increased susceptibility to infections. These effects are marked in malnourished children with measles. Researchers have demonstrated alterations in T-lymphocyte ratios and responses to stimulants in malnourished individuals similar to those seen in AIDS patients.²⁹

Pressure to grow cash crops for export and displacement of Africans from the best cropland have been the major contributors to chronic marginal nutrition in 20th century Africa. In 1950, for example, Europeans seized 7,560 square miles of productive land in Kenya for about 14,000 settlers, while the remaining 34,070 square miles were left to support over five million Africans.

African diets have been severely altered by colonialism. Pastoralists in Kenya had good diets, consisting of meat and milk, before British colonial rule. European ranching interests, however, restricted African herding and eventually led to overgrazing, erosion, and loss of animals.³⁰

In western Zambia, labor migration transformed what Dr. Livingston described in 1853 as a "fruitful" and "fertile" valley to famine conditions in the 1960s. In the western African Sahel, coercion of African farmers to grow peanuts for the French cooking oil business led to monocropping, which depleted the soil, overused fallow areas, interfered with seasonal migration and millet production, and disrupted the grain and milk exchanges that were mutually beneficial to farmers and pastoralists.

Between 1974 and 1982, the area devoted

to major export crops such as coffee, cocoa, tea, sugar, cotton, tobacco, and hard fibers grew by 11.4%, according to FAO figures. As recently as 1970, Africa was producing enough food to feed itself. But by 1984, "some 140 million Africans—out of a total of 531 million—were fed with grain from abroad."³¹

The continued famine in Africa is occurring at a time when world food production is outpacing population growth. The problem is not an absolute shortage, but food distribution and slow income growth.³²

Rural-Urban Migrations

The displacement of rural populations is another feature of African life contributing to the emergence of epidemics. Unable to compete with large-scale agricultural projects or survive declining agricultural prices and ecological deterioration of their farmlands, Africans have moved to urban centers, creating dense, peri-urban societies. Between 1950 and 1980, the populations of Nairobi, Dar es Salaam, Lusaka, Lagos, and Kinshasa increased more than *seven fold*.

Many of these new urban residents are unable to find permanent employment or housing. They survive by participating in the informal sector or illegal activities such as beer brewing and prostitution in overcrowded slums. This precarious existence threatens both their health and that of the community at large. A markedly higher prevalence of most infectious diseases, including tuberculosis, pneumonia, venereal disease, and malaria have been found among the more marginally employed, as compared to permanent workers in Jimma, Ethiopia.³³



Photo/David Gerratt

The tendency for many urban dwellers to regularly return to their rural homes, and the more formal use of migrant labor in the mining industry of southern Africa, meant that many of the diseases in the densely settled urban areas of Africa have eventually found their way back to the rural areas. Tuberculosis, cholera, and plague have all been disseminated in this manner.³⁴

centered on the fact that patients came from the vicinity of Hiroshima and Nagasaki."³⁸ HTLV-I has now been found in Africa,³⁹ the Caribbean,⁴⁰ the southeastern U.S., and parts of South America and southern Italy.⁴¹

HTLV-II has not been definitely associated with disease, and HTLV-IV has only recently been identified. In addition, the research group at the National Cancer

younger people more aggressively than the former endemic Kaposi's.⁴⁶ In the West, AIDS in intravenous drug abusers and recipients of transfusions develop Kaposi's sarcoma with lower frequencies than those in other risk groups.

AIDS is appropriately called a syndrome. It is apparently a set of diseases with several sets of causal components resulting in a set of disease states.⁴⁷ Some cofactors, such as concurrent infectious disease, may activate T-cells and allow viral agents to enter in the first place. Still other factors may act at a later stage to stimulate proliferation of viral agents and infected cells.

Origins

One hypothesis as to the origin of AIDS in humans is that a form of the viruses has existed for hundreds of years, but resided in isolated populations. In the past thirty years, Africa's tribal and geographic boundaries have broken down as individuals moved towards cities, and could have brought an infectious agent into contact with previously unexposed individuals. Thus, the devastating effects of the virus could be felt more readily, both locally and internationally.⁴⁸

The epidemiology of the Visna virus illustrates such a process. Visna is Icelandic for "wasting", and causes a disease in sheep similar to AIDS. The virus belongs to a group of lentivirus or slow-growing viruses that are genomically and functionally similar to the HTLV-III virus.⁴⁹ In 1933, it "suddenly appeared" in Icelandic sheep. In that year, the government bought twenty karakul sheep from Germany, where a Visna-like virus was endemic, causing a milder illness than what was later seen in Iceland.

This slow virus had devastating effects. From 1939 to 1952, at least 150,000 animals died of the infection. To control the epidemic, all of the sheep in southern Iceland eventually had to be killed. It is likely that "centuries of isolation made Icelandic sheep particularly susceptible to Visna."⁵⁰ The analogy to AIDS is clear.

Another major hypothesis is that HTLV-III entered the central African population from an animal reservoir, perhaps in the 1950s. This hypothesis is based on the finding of a simian (monkey) virus similar to HTLV-III.⁵¹ It is suggested that this simian virus "jumped" species and mutated, or mutated and "jumped", or perhaps both. This theory is substantiated by molecular biological methods demonstrating ultrastructural and major protein similarities between simian (STLV-III) and human (HTLV-III) viruses.

Furthermore, specimens from "healthy African green monkeys (*Ceropithecus aethiops*) possess antibodies reactive with STLV-III viral proteins...and cross reactivity with viral proteins of HTLV-III."⁵² A simian AIDS (SAIDS) has now been reported at the New England Primate Center⁵³ and the California Regional



Photo/David Gerratt

The AIDS Viruses

We must examine the emergence of the apparently new set of viruses attacking the immune systems against this setting of changing ecological and disease relationships, and of populations with altered immune systems. There have been several attempts to trace the emergence of these viruses.

The set of viruses suspected of "causing" AIDS belongs to a family of viruses which directly infect some of the thymus-derived or T-cell lymphocytes, specifically the T4 or helper/inducer cells. These so-called T-lymphotropic viruses are also found in macrophages and other cells.

The human T-lymphotropic viruses (HTLV) are retroviruses; that is, their genome is made of RNA and they manufacture an enzyme, reverse transcriptase, which allows integration into the host cell DNA.³⁵ HTLV type III is also known as Lymphadenopathy Associated Virus (LAV) or Human Immunodeficiency virus (HIV).³⁶ To date, four types of HTLV have been identified.

HTLV-I has been closely linked with human adult T-cell lymphoma/leukemia (ATLL) and has been found in healthy monkeys (*Macaca fuscata*) in southern Japan.³⁷ The initial search for the cause of the clusters of ATLL in southern Japan "first

Institute has described finding a patient with "a mixed HTLV-I/HTLV-III infection."⁴²

HTLV-III, the putative cause of AIDS, is extremely heterogeneous in its composition.⁴³ Strains differ most in their protein envelope. This antigenic variation not only contributes to the viruses' ability to escape the immune-surveillance system, but also makes vaccine development difficult. To date, an effective vaccine has been made against only one retrovirus, the feline leukemia virus, a relative to the HTLV virus.

Additionally, the HTLV-III appears to mutate over time within individuals. Four to six variations have been found within a given AIDS sufferer. These variations appear to come from one progenitor, suggesting that infection with one major strain interferes with infection by others.⁴⁴ This provides some hope for vaccine development.

Moreover, there are regional and individual differences in the clinical presentation of AIDS, though these have not yet been correlated with the different HTLV-III strains. Within Africa, for example, the form of AIDS called "slim disease" in Uganda⁴⁵ leads to extreme wasting, but is associated with fewer cases of Kaposi's sarcoma than AIDS cases in other areas. In Zaire, Kaposi's sarcoma has now appeared in a new form, attacking

Primate Research Centers.⁵⁴

The African swine fever virus has also received attention.⁵⁵ As a nonlymphotropic DNA virus, this connection has been questioned.⁵⁶ It is possible, however, that a second agent increases virulence (as is proposed with human genital cancer and the papilloma virus, for example).⁵⁷ Or perhaps it plays an enhancing role analogous to that of the delta agent, with respect to the virus of Hepatitis B.

Possible mechanisms of viral interactions have been described.⁵⁸ These include: 1) complementary immunosuppression, as with Epstein-Barr virus or cytomegalovirus; 2) alterations in surface antigens by human retroviruses, increasing receptors for second lytic viruses; 3) genetic alterations where an encoded virus generates growth-enhancing factors for another (as is seen between adeno and adeno-associated virus) as well as certain murine, avian, and primate sarcoma viruses which depend on a helper virus to become cancerous; 4) phenotypic mixing, or the incorporation of one virus into the envelope of another, as seen with cytomegalovirus and murine leukemia virus; and finally 5) genetic recombination, which occurs among

the influenza viruses, herpes viruses, and in retroviruses.

Species Transfer

Several modes of transmission from primates to humans have been proposed. It has been reported that a type D retrovirus has been isolated from the saliva and urine of rhesus monkeys with SAIDS,⁵⁹ and HTLV-III has now been isolated from insects.

Burnett describes several transfers of diseases from one species to another. In 1896 in southern Africa, for instance, rinderpest jumped from cattle to antelope and buffalo, eliminating its new host. This transfer removed the primary source of blood meals for tsetse flies in the region and has eliminated sleeping sickness from the Zambesi and Limpopo river valleys to this day. Another microorganism, the monkey herpes virus, is harmless to its usual hosts (the Indian rhesus and Malayan cynomolgus) but is almost as lethal to humans as rabies virus.

If such a transfer of HTLV-like viruses has occurred in Africa, it is critical to ask

why this occurred. Most queries ignore the possibility that the transfer of AIDS-related viruses between species may have been facilitated by decades of maldevelopment and ill health, which left populations with suppressed or altered immunity. Alterations in host immunity can contribute to dramatic changes in disease patterns.

Selection of resistant and virulent variants of microorganisms may be encouraged in several ways. The overuse of antibiotics and the creation of immunologically suppressed internal environments are two methods. One clear example comes to us from the "developed world". Organ transplant units and oncology units have, in a sense, produced "sentinel groups" through the use of immune-suppressant drugs. "The occurrence of Kaposi's sarcoma in patients receiving immunosuppressive drugs...provided a link between (that) tumor and depressed cellular immunity."⁶⁰ Is it not possible that immune-suppressed people in Central Africa became host "sentinel groups" in the emergence and transfer of AIDS?

Immunologically altered patients have become prey to previously nonpathogenic microorganisms and drug-resistant infections. Immunosuppression may also be crucial in determining the frequency with which latency is the outcome of primary infections. Latency periods may allow for increased chance of mutation and antigenic variation. Immunosuppression may also trigger reactivation of latent infections by disrupting anatomic barriers or disturbing internal ecological balances.

We may speculate that given a well-functioning immune surveillance system, mutations of established strains are most often recognized as foreign and are rejected. With a weakened system of surveillance, variants of viruses might escape proper response and form a new clone which takes hold. Nonpathogenic HTLV-III strains may have been present for a long time; host weaknesses might have encouraged selection of pathogenic variations.

The Global Setting

We need to understand the historical context within which changes in AIDS occurred in Africa, so that we can better understand the changes which are still going on there and in the rest of the world. We must learn more about the conditions which contribute to changes in the hosts and in the AIDS virus. Similarly, the rapid spread of AIDS in African cities must be examined in light of the wider social and economic development described above, as well as the impact of these developments on human/pathogen relationships.

In Eastern Zaire, for example, rural populations show a high prevalence of HTLV-III antibodies, but not a high incidence of active AIDS disease.⁶¹ Over the last two decades, in response to declining economic opportunities and generalized impoverishment in the rural



Photo/David Gerratt.

areas, these same populations have been steadily moving to the large towns and cities of Zaire, Rwanda, and Uganda, where AIDS is now widespread. Within the precarious existence of urban life, their nutritional and health status may suffer, as in the case of the seasonal day laborers in Jimma.

Though it is difficult to design studies which can provide hard data, it is possible that societal shifts and altered immune statuses contributed to the selection of virulent viral strains. There is no question that these changes play a role in viral transmission.

Epidemics

"Epidemics correspond to large signs of warning which tell the true statesman that a disturbance has occurred in the development of his people which even a policy of unconcern can no longer overlook." *Rudolph Virchow, August 1948*

The emergence of epidemics is often related to social and historical changes. The bubonic plague in the Middle Ages is the classic example. Louse-borne typhus, a rickettsial disease, is another epidemic classically associated with war.

Tuberculosis became the "great white plague" during the industrial revolution. In Boston, New York, Philadelphia, Charleston, London, Paris, and Berlin, tuberculosis mortality rates were higher than 500 per 100,000 inhabitants in 1850.

Syphilis spread rapidly through all social classes in Europe during the great population shifts of the 15th and 16th centuries. Interestingly, the virulence of syphilis spontaneously decreased during succeeding centuries. During the 16th century, syphilis was common, but not virulent, among Native American Indians. In the 20th century, there are areas in India which have a high incidence of positive serological tests, but with little overt pathology.

Disease attenuation and exacerbation may reflect endogenous changes in infecting organisms, and may also reflect exogenous changes in the environment. Certainly, the sanitary and environmental developments in the West during the late 19th and 20th centuries contributed to the decline in tuberculosis mortality. Environmental changes were responsible for eradicating malaria from the United States.

Current changes in population and the pattern of AIDS itself are now contributing to its resurgence in the West. While we may hope for spontaneous attenuation, an understanding of the ecological factors involved in AIDS must be pursued and will help mold our search for biological means of control.

The epidemic of AIDS threatens us all. Seeking to understand the biological roots of AIDS may help us to formulate vaccines. Exploring the social roots of AIDS is vital as

we seek to control its spread through the promotion of "lifestyle" changes.

Clarifying the historical interactions which have altered populations must be considered in our search for cofactors. Conditions such as prostitution and drug abuse cannot be divorced from poverty and fear any more than international drug trafficking can be separated from the impossible demands of the world debt crisis. Understanding the underlying causes of cofactors is important, lest we "blame the victim" in our study of the disease.

Current Western economic and development strategies for Africa continue the patterns developed during the colonial period. Major financial institutions, aid agencies, and firms encourage the same mode of development. Populations continue to be displaced from the most fertile lands, foods such as fish and nuts are exported, massive urban migrations continue, and desertification advances.

Large-scale World Bank development programs such as the Botswana livestock project, for example, are now coming under attack by environmental groups like the Worldwatch Institute, the World Resource Institute, the Environmental Defense Fund, and the National Wildlife Federation. While raising meat exports, large areas of land and

AIDS, as it emerges throughout the globe, invading our physical and psychological lives, concretely demonstrates the interdependence of the "developing" and the "developed" world. AIDS has become a metaphor for the global connections we all share. What happens in Africa affects what happens in North America. Famine in Africa and the wars which, according to a recent United Nations report, have replaced drought as the number-one factor in the continuing famine of 18 million Africans are destructive to "our" lives as well. The drastically inadequate response from the West to the economic imbalances across the globe ultimately does affect *our* lives dearly.

Recommendations

Scientists working to develop specific immunity and treatment for AIDS must have our full support. We are fortunate that the field of modern molecular biology has advanced at the same time that this epidemic has unfolded. There must be exponential leaps in funding the development and trials of vaccines. Drug development and treatment programs should be expanded to enroll *all* AIDS victims.



Photo/David Gerratt

wildlife have been devastated through overgrazing.

Disregard for environmental changes is evident in rich forest areas in West Africa, Southeast Asia, and Central America. Development in Brazil's Amazon, which contains one-third of the earth's tree population and is the major supply of our oxygen, has already eliminated one-fourth of its forest. It is this extensive "maldevelopment" which sets the stage for today's major epidemic of malnutrition and the unabated pandemic of parasitic, bacterial, and viral illnesses.

In the U.S. alone, estimates range from 290,000 to 350,000 AIDS victims by 1991 (provided no further transmission of the viruses), with a treatment budget of \$8 to \$16 billion.⁶² The \$100 million over five years awarded to fourteen U.S. institutions through the National Institute of Allergy and Infectious Disease and grants through the National Cancer Institute are not enough. In addition to expanded educational and public health measures, greater social supports must be forthcoming.

At the same time, scientists addressing development and ecological issues must

receive much greater support. Major threats to global balances lie in the essential field of energy generation. Solar energy is key to many environmental concerns. It could be used to desalinate ocean water and help regenerate desertified land. Solar energy can replace the burning of fossil and nuclear fuels, which pollute and increase atmospheric carbon dioxide, considered the major factor in the "greenhouse effect".⁶³ (And as ice caps, which contain three percent of the earth's water, begin to "melt down", solar desalination may provide us with a global system to "bail us out" against the rising seas.)

Finally, resolving the global economic imbalances and equalizing development must become a concern for all who wish to address the network of causes of the AIDS epidemic, and to prevent future threats. The world debt, which is about to pass the \$1 trillion mark, is a major impediment to Third World development. The expansion of Third World poverty is now reducing markets for industrialized nations. World economic and developmental issues are major determinants of our health.

The AIDS epidemic must provide a positive incentive to us all. The struggle to overcome AIDS, to end nuclear madness, and to achieve equality and peace are crucial to everyone's future. We are suffering simultaneously from overdevelopment and underdevelopment, from overconsumption and underconsumption. We must search for and develop the strengths found in the survivors of both extremes.

In the final analysis, we can blame neither the victims nor the victimizers. The overall problem involves national and international relations based on competition and domination. Our continued evolution on this planet requires that collaboration, symbiosis, and synergism become the dominant forces. Working together, we may still have a chance to rebuild our collective defense system.

REFERENCES

1. "Transmission of AIDS Assessed in Third World Countries." *Internal Medicine News*, Vol. 19, 11 (June 1986).
2. Weber, J. "Is AIDS an Epidemic Form of African Kaposi's Sarcoma?" *Journal of the Royal Society of Medicine*, 1984, 77:572-76. DeCock, K.M. "AIDS: An Old Disease from Africa?" *British Medical Journal*, 1984, 289:306-08.
3. Broder, S. and Gallo, R.C. "A Pathogenic Retrovirus (HTLV-III) in Uganda before 1973." *Science*, 1985, 227:1036-38. Bigger, R.J., Johnson, B.K., Oster, C. et al. "Regional Variation in Prevalence of Antibody against Human T-lymphotropic Virus Types I and III in Kenya, East Africa. *International Journal of Cancer*, 1985, 35:763-67, and others.
4. Dubos, R. *Man Adapting*. Yale University Press, 1980, p.96.
5. Burnet, M. and White, D.O. *Natural History of Infectious Disease*. Cambridge University Press, 1972. The animal cell may represent a symbiotic relationship between prokaryotic bacteria *CUM* mitochondria and an early eukaryotic cell structure; as algae may with respect to the plant cell. The *Paramecia bussaria* harbors the microscopic algae of the *Chlorella* species. What might be thought of as an infection is a "successful and almost indispensable association" (Dubos).
6. Hartwig and Patterson, D. *Disease in African*



Photo/Harriet Carter

History. Durham, Duke University Press, 1978.

7. Marks, S. "Khoisan Resistance to the Dutch in the Seventeenth and Eighteenth Centuries." *Journal of African History*, 13, 1 (1975), 55.

8. Isaacman, A., Isaacman, B. *Mozambique: From Colonialism to Revolution, 1900-1982*. Colorado, Westview Press, 1983, p. 18.

9. Curtin, P. "Epidemiology of the Slave Trade." *Political Science Quarterly*, 83 (1968), 190-216.

10. Hartwig and Patterson, op. cit.

11. Luzzatto, et al. "Malaria and the Red Cell." *Ciba Foundation Symposium*, 94, London, Pittman, 1983.

12. Patterson, K. David. *Health in Colonial Ghana*. Waltham, Crossroads Press, 1983, 34.

13. Mastbaum, O. "Past and Present Position of Malaria in Swaziland." *Journal of Tropical Diseases and Hygiene*, 60, 5 (1960), 119-127.

14. Patterson, K., op. cit.

15. Desowitz, R.S. "How the Wise Men Brought Malaria to Africa." *Natural History*, 85 (1976), 36-44.

16. Packard, R.M. "Maize, Cattle and Mosquitoes: The Political Economy of Malaria Epidemics in Colonial Swaziland." *Journal of African History*, 25 (1984), 189-212.

17. Harrison, G. *Mosquitoes, Malaria and Man: A History of the Hostilities Since 1880*. New York, Dutton, 1978.

18. Williamson, W.A. and Greenwood, B.M. "Impairment of the Immune Response to Vaccination after Acute Malaria." *Lancet*, 1 (1979). McBride, J.S., Mickleman, H.S., Ure, J.M. *Immunology*, 1977, 32, 635.

19. *Tropical Disease Epidemiology*. Chapter 11, 5 (1985).

20. Burkitt, D.P., et al. "Geographical and Tribal Distribution of the African Lymphoma in Uganda." *British Medical Journal*, 569, 1966. O'Connor, G.T. "Persistent Immunological Stimulation as a Factor in Oncogenesis, with Special Reference to Burkitt's Tumor." *American Journal of Medicine*, 1970, 48, 279-85.

21. Geldand, M. *The Sick African* (1960).

22. Volksy, D., et al. "Antibodies to HTLV in Venezuelan Patients with Acute Malaria Infections." *New England Journal of Medicine*, 1986, 314:647-48. Bigger, R., et al. "ELISA HTLV Retrovirus Antibody Reactivity Associated with Malaria and Immune Complexes in healthy Africans." *Lancet*, 1985, ii:520-33.

23. Timberlake, L. *Africa in Crisis*. Philadelphia, Earthscan, 1986, Chapter 4.

24. Ford, J. *The Role of Trypanosomiasis in African Ecology*. London, Oxford University Press, 1971.

25. Loening, W.F.K., Coovada, H.M. "Age-specific Occurrence of Rate of Measles in Urban, Peri-urban, and Rural Environments: Implications for Time of Vaccination." *Lancet*, 1983, ii:324-26.

26. Mackiowak, P.A. "Microbial Synergism in Human Infections." *New England Journal of Medicine* 1978, 298:21-6, 83-7.

27. Smythe, P.M., Showland-Breton, Stiles, et al. "Thymolympathic Deficiency and Depression of Cell-mediated Immunity in Protein-Calorie Malnutrition." *Lancet*, 1971, ii:939-44.

28. Ibid.

29. Chandra, R.K. "Lymphocytia Subpopulations in Human Malnutrition: Cytotoxic and Suppressor Cells." *Pediatrics*, 1977, 59:423-27. Chandra, R.K. "Immunodeficiency in Undernutrition and Overnutrition." *Nutrition Review*, June 1981, 39 (6):225-31. Chandra, R.K. "Nutrition, Immunity and Infection: Present Knowledge and Future Directions." *Lancet*, 1983, i:688-91.

30. Chasin, B., Franke, R. *Seeds of Famine*. Ottawa, Rowman and Allenheld, 1980.

31. Ford, J., op. cit.

32. Schneider, K. "Scientific Advances Lead to Era of Food Surplus Around the World." *New York Times*, Sept. 9, 1986.

33. Geil, R., van Luijk, R.N. "The Plight of the Daily Laborer in a Coffee Growing District of Ethiopia." *Tropical and Geographical Medicine*, 1967, 19:307.

34. Ibid; Packard, R.M. "Industrialization, Rural Poverty and the History of Tuberculosis in Southern Africa." In S. Feierman and J. Janzen, *Health and Society in Africa*. Berkeley, University of California Press, forthcoming.

35. Ratner, L., et al. "Human and Primate Telymphotropic Retroviruses (HTLV and PTLV): Subtypes, Biological Activity and Role in Neoplasia." In Rigby, P.W.J. and Wilkie, eds. *Viruses and Cancer*. Cambridge, Cambridge University Press, 1985, 261-90.

36. *Science*, 1986, 232:697.

37. Takatsuki, et al. "Adult T-Cell Leukemia in Japan." In Seno, Setal, eds. *Topics in Hematology*. Amsterdam, Excerpta Medica, 1977:73-77. Miyoshi, I., et al. (Letter) *Natural Adult T-Cell Leukemia Virus Infection in Japanese Monkeys*. *Lancet*, 1982, ii:658.

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THE EPIDEMIOLOGY OF AIDS IN AFRICA

BY NANCY KRIEGER

Central African countries have thus far accounted for the vast majority of AIDS cases in underdeveloped nations and are home to a substantial portion of the ten million people estimated to be infected worldwide. As a consequence of distorted, export-oriented economies shaped by centuries of colonial rule, these countries typically confront the conjoint problems of an increasingly peripheralized peasant labor force, social disintegration of rural society, and a growing migrant labor force. The emergence of squalid slums surrounding major cities (with contingent high rates of unemployment and prostitution) plus war and its aftermath are further problems these countries often face.

Lacking adequate resources to counter the diverse diseases which flourish under such conditions, these nations suffer enormously from malnutrition, malaria, measles, tuberculosis, and venereal disease—all of which are *preventable* ailments. Not accidentally, evidence suggests that these interrelated social and biological factors may exert a profound influence on the distribution and spread of AIDS in this region.

Initially, the demographic profile of African AIDS cases showed little variation by gender, but marked gradations by social class and age. Consisting predominantly of either relatively affluent urban residents or prostitutes, these early AIDS patients were typically 20-40 years old; the same age range, male-to-female ratio, and affluent/indigent polarity characterized the many who test positive for the HIV-antibody.¹

Subsequently, AIDS has struck almost every strata of society, attacking both rural and urban regions. Presently, in some parts of Africa, nearly 25% of the adult and 10% of the pediatric patients in hospitals test positive for HIV, as do nearly 10% of pregnant women in several maternity hospitals. Although controversy initially existed as to whether AIDS constituted a new malady or was an endemic (but previously unreported) disease, most researchers now agree that AIDS first surfaced in Central Africa during the 1970s, spreading from Zaire and Rwanda to Zambia and then to Uganda and Tanzania.²

In contrast to developed countries, the main risk factors for adult acquisition of AIDS in Central Africa do not seem to include homosexuality, intravenous drug use (IVDU), or blood transfusions. Only two studies have indirectly implicated homosexual transmission: one reported that several bisexual male traders routinely traveling between Uganda and Tanzania were seropositive,³ while another mentioned a gay Zairian with AIDS who had sexual

Nancy Krieger is a Ph.D. candidate in epidemiology at the University of California, Berkeley.



contact with men from Europe, the United States, and also Zaire.⁴

No studies have documented IVDU as a risk factor, but two have suggested that HIV-laden blood may be exchanged by either the use of unsterile needles (in both medical and traditional healing settings) or ritual scarification.⁵ Two other investigations, however, reported no association between either intramuscular shots or bloodletting and AIDS.⁶ New evidence suggests, however, that while AIDS cases due to transfusions of HIV-laden blood were initially rare, they now are becoming more common—and among healthy blood donors in some regions, seropositivity rates have reached nearly 20%.⁷

How, then, is AIDS spreading in Central Africa? Apparently, the predominant route is penile-vaginal intercourse—coupled with poverty, numerous partners, prostitution and venereal disease.⁸ For example, the first documented Ugandan cases of AIDS occurred in 1982 in “an exceptionally squalid village;” the only identified risk factor for HIV-seropositivity for seven seropositive spouses of eight AIDS patients was sexual contact with their spouse.⁹

In a remote region of southeastern Zaire in 1984, researchers observed a marked social-class gradient for seropositivity, with highest risk occurring among the poorest agricultural workers. Further, among 38 patients (18 women, 20 men) diagnosed with AIDS during a three-week period in Kinshasa, Zaire in 1983, investigators discovered evidence of two heterosexual case clusters, each involving at least five persons; one cluster included not only the wife and female lovers of a businessman, but his maid as well.¹⁰ Moreover, the male AIDS patients in this study were more likely to have VD as compared to controls.

Similarly, of 26 AIDS patients (17 relatively affluent men and 9 women of varied economic standing) diagnosed in Kigali, Rwanda during October 1983, 11 of the 17 men routinely used prostitutes, while three of the women were prostitutes and two were wives of men who used prostitutes.¹¹

To explain why VD might be a risk factor for AIDS, rather than simply a proxy for a number of sexual partners, several researchers have suggested that VD may reduce epithelial tissue integrity, thus creating open lesions which facilitate transmission of the virus, while others have hypothesized that VD might provoke a lymphocyte response which can result in a greater inoculum of virus being transferred during intercourse.

The hypothesis that social conditions mediate heterosexual AIDS transmission is further bolstered by the comparable findings of two studies involving Central African prostitutes, their clients, and healthy controls. Both found that prostitutes and their clients were at higher risk for being seropositive on account of having more sexual partners, higher rates of VD, and either being able to afford to buy sex or

needing to sell it to survive.

In the first study, conducted during July 1984 in Butare, Rwanda (site of the National University of Rwanda and an important military camp), 96% of the prostitutes reported having penile-vaginal sex *only*, and none of the prostitutes or their clients admitted to IVDU, homosexuality or blood transfusions within the past five years.¹²

The second study, carried out in Nairobi, Kenya between February and April 1985, not only replicated these findings, but also demonstrated a link between socioeconomic status (SES), seropositivity, and VD. Differentiating between types of prostitutes, the investigators found that “lower SES” prostitutes (women who worked in “economically depressed neighborhoods,” were paid \$0.50 per encounter, and averaged almost 1,000 encounters a year) were more likely to test positive for HIV-antibody and syphilis than were “higher SES” prostitutes (women who worked at tourist bars and hotels, were paid \$5 to \$15 per encounter, and averaged about 125 encounters a year).¹³

Accordingly, researchers are now suggesting that the spread of AIDS in Central Africa can in part be explained by the combined factors of prostitution and contact with traveling businessmen, professionals, tourists, and soldiers.

With HIV infecting women in their reproductive years, it seems likely that AIDS will join the ranks of Central Africa's endemic childhood infectious diseases. At present, however, data on AIDS-related childhood morbidity and mortality remain inconclusive: two studies have found little or no evidence of seropositivity or AIDS among Central African children in regions where AIDS occurs in adults, while two have reported positive findings. To explain

the former, researchers have hypothesized that pediatric AIDS might either mimic or increase susceptibility to the widely prevalent and severe infant and childhood maladies typical of underdeveloped countries, such that illness and death would be attributed to these diseases rather than to AIDS.

Paradoxically, the presence of these latter ailments might also account for the positive HIV-antibody tests observed in other Central African children. For example, investigators in southeastern Zaire not only ascertained that 35% of children as compared to 12% of adults tested seropositive, but also discovered a parallel age distribution of malarial infection (*P. falciparum*).¹⁴

To account for the observed association, they proposed four different hypotheses: 1) HIV seropositivity and malaria are causally unrelated, but are independently linked to the age and poverty structure of the rural population; 2) HIV could be transmitted by either mosquitoes or the malaria parasite itself; 3) immunosuppression due to malaria could permit expression of HIV (as in the case of malaria and the Epstein-Barr virus, leading to Burkitt's lymphoma); or 4) the test for HIV is nonspecific in the presence of malaria or other poverty-related viral or parasitic diseases, such that cross-reactivity creates false positives.

This last hypothesis recently received further corroboration from two studies conducted in Venezuela, a country yet to report any AIDS cases: both aboriginal Amazonian Indians and Venezuelan miners infected with malaria tested positive for HIV-antibody, while healthy blood donors living in a variety of coastal and inland cities did not.

The prevalence of malaria and other



Photo/Harriet Carter

uncontrolled zoonotic diseases (animal diseases which can be transmitted to humans) in Africa has also prompted a handful of investigators to suggest that AIDS could spread by insect vectors. Others have discounted this proposal by stating that, for it to be true, HIV-seropositivity and AIDS should occur in persons of all ages, not just sexually-active adults. This objection, however, cannot be considered definitive until investigators determine if Central African children, both healthy and ill, carry HIV.

Apart from insects, other forms of zoonotic transmission may exist, facilitated by both economic dependence on draft and other domestic animals, and the increasing development of wilderness areas (which potentially could expose people to new pathogens). In fact, many researchers now believe HIV initially entered the human population through contact with the African green monkey, a species already implicated as a reservoir for the Ebola, Marburg, and African yellow fever viruses.

Scientists have isolated an HIV-like virus (STLV-III) from both wild African green monkeys captured in Central Africa and several monkeys stricken by an AIDS-like


disease while living in primate research centers. Further, despite the fact that AIDS has yet to be documented in Senegal, a recent study reported that 6.9% of 289 prostitutes and 4.1% of healthy controls in Senegal were seropositive for STLV-III, but not for HIV.

One researcher, mindful of the relationship between zoonotic disease and underdevelopment, has recommended that domestic animals, not just primates, be tested for HIV or related viruses because "Africans live much less closely with primates of any kind than with cattle, goats, and other domestic animals."¹⁵

In conclusion, it is apparent that the dynamics of underdevelopment create a constellation of risk factors which profoundly influence the propagation of HIV, and render the epidemiological profile of AIDS in Africa distinct from that of developed countries. There is a lethal combination of disastrous levels of ostensibly preventable infectious and parasitic diseases with grossly inadequate health resources (leading to the forced use of unsterilized blood for transfusions and reuse of unsterilized needles, as well as high rates of untreated VD). These factors not

only facilitate the spread of AIDS, but also cannot be understood apart from the linked conditions of poverty, migration, rapid urbanization, prostitution, and social upheaval which characterize underdeveloped countries.

While the current epidemiology of AIDS in Africa is certainly dire, it is not immutable. At one level, stemming the spread of this devastating and thus far incurable disease will obviously require an immediate massive international effort geared towards education, adequate supplies of syringes and HIV-free blood for transfusions, and the development of a vaccine.

But beyond this, it is equally clear that the implementation and success of these programs ultimately will depend more on politics than science. The battle against AIDS in Africa is of necessity linked to the struggle against underdevelopment, and only intervention efforts premised upon this basis will be able to prevent the African AIDS crisis from becoming an utter catastrophe. 

NOTES

1. The International Committee for the Taxonomy of Viruses has recently proposed that the retrovirus implicated as the causative agent of AIDS be called "HIV" (human immunodeficiency virus), and that this name replace its other current designations (HTLV-III, LAV, and ARV). See Coffin, J., Haase, A., et al. "Human Immunodeficiency Virus" (Letter). *Science*, 1986, 236:69.
2. Biggar, R.J. "The AIDS Problem in Africa." *Lancet*, 1986, 1:79-82; Quinn, T.C., Mann, J.M., Curran, J.W., Piot, P. "AIDS in Africa: An Epidemiologic Paradigm." *Science*, 1986, 234:955-963.
3. Serwadda, D., Sewankambo, N.K., Carswell, J.W., et al. "Slim Disease: A New Disease in Uganda and its Association with HTLV-III Infection." *Lancet*, 1985, 11:849-852.
4. Colebunders, R., Taelman, H., Piot, P. "AIDS: An Old Disease from Africa" (Letter). *British Journal of Medicine*, 1984, 289:765.
5. Buchanan, D.J., Downing, R.G., Tedder, R.S. "HTLV-III Antibody Positivity in Zambian Copper Belt." *Lancet*, 1986, 1:155; Bayley, A.C., Chiensong-Popov, R., Dagleish, A.G., et al. "HTLV-III Serology Distinguishes Atypical and Endemic Kaposi's Sarcoma in Africa." *Lancet*, 1985, 1:359-361.
6. Piot, P., Taelman, H., Minlangu, K.B. et al. "Acquired Immunodeficiency Syndrome in a Heterosexual Population in Zaire." *Lancet*, 1984, 11:65-69. Also Serwadda et al. "Slim Disease..." op. cit.
7. Quinn, T.C. et al. "AIDS in Africa," op. cit.
8. Biggar, R.J. "The AIDS Problem in Africa," op. cit.
9. Serwadda, D. et al. "Slim Disease," op. cit.
10. Piot, P. et al. "Acquired Immunodeficiency Syndrome..." op. cit.; Biggar, R.J., Melbye, M., Kestens, L., et al. "Seroepidemiology of HTLV-III Antibodies in a Remote Population of Eastern Zaire." *British Journal of Medicine*, 1985, 290:808-810.
11. Van de Perre, P., LePage, P., Kestelyn, P., et al. "Acquired Immunodeficiency Syndrome in Rwanda." *Lancet*, 1984, 11:62-65.
12. Van de Perre, P., Carael, M., Robert-Guroff, M., et al. "Female Prostitutes: A Risk Group for Infection with Human T-Cell Lymphotropic Virus Type III." *Lancet*, 1985, 11:524-526.
13. Kreiss, J.K., Koech, D., Plummer, F.A., et al. "AIDS Virus Infection in Nairobi Prostitutes." *New England Journal of Medicine*, 1986, 314:414-418.
14. Biggar, R.J. et al. "Seroepidemiology of HTLV-III Antibodies..." op. cit.
14. Biggar, R.J. "The AIDS Problem in Africa," op. cit.



ENVIRONMENTAL MISMANAGEMENT



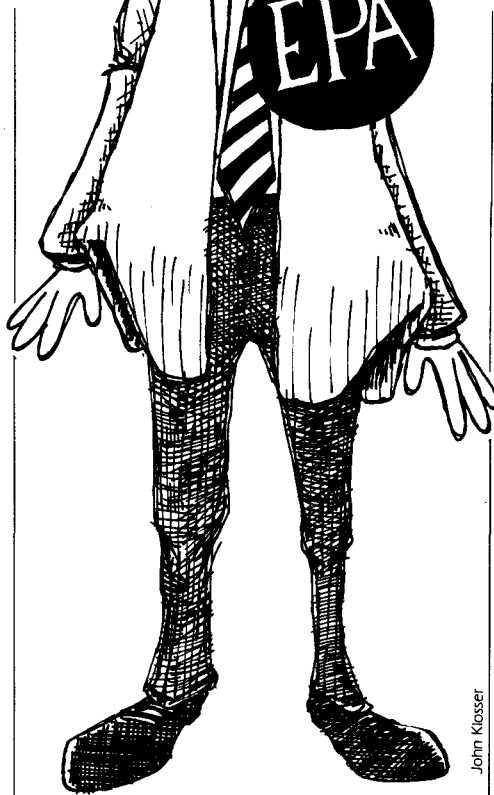
BY SIDDARTH DUBE

The EPA's policies on toxic air pollution are "a death warrant for some residents in the Kanawha Valley," says Perry Bryant, former director of the West Virginia Citizens Action Group. The Kanawha Valley is home to Union Carbide's Institute plant, as well as to nearly 200 other industrial plants.

Toxic emissions are the Valley's most serious environmental problem, with nearly 10,000 tons of toxic pollutants emitted into the air each year. West Virginia Health Department studies show that cancer mortality rates were 25 percent higher than the national average from 1968 to 1972, and 21 percent higher from 1973 to 1977. "The EPA, over the years, has had many failures," says Bryant. "But none as bad as toxic air pollution."

There is little substance to the prevailing belief that toxic air pollution is being controlled in the United States today. For over seven years, the Environmental Protection Agency (EPA), environmental groups, Congress, and the chemical industry have recognized that the first step in managing such pollution is to use state-of-the-art pollution control technology on sources of hazardous pollutants. This essential first step has yet to be taken.

Toxic air pollutants were not a major concern at the EPA in the 1970s. To the degree that the agency worked on these pollutants, it focused on carcinogens. In the 16 years since the passing of the Clean Air Act, however, the EPA has set regulations for only six carcinogens. It has sidestepped regulation of several other



John Klosser

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Air Pollution
Controls

known human carcinogens, and has yet to move on a score of compounds that are probable human carcinogens. Even less action has been taken on chemicals that cause birth defects or mutations in humans, or on the health effects of various synergistic toxic pollutants.

Risks from accidental releases of toxic chemicals into the air have not been dealt with. Federal initiatives still focus solely on contingency planning, not on preventive measures. And legislation that would require evaluation of accidental risks has come nearly two years after the fatal release of methyl isocyanate in Bhopal, India that killed and injured thousands.

The EPA's traditional assumptions about exposure to routine emissions of toxic pollutants are also under scrutiny. For many years, the health effects of such exposure were assumed to be a factor of total exposure level in relation to total length of exposure. The EPA is now concerned about acceptable daily intake levels, emissions that "could be routine in the way in which they are emitted, but at a higher concentration over a shorter duration," says Robert Kellam, chief of the EPA's Program Analysis and Technology section.

Such concentrated exposures could exceed acceptable daily intake levels, threshold points below which exposures are assumed to be safe. "If (the acceptable daily intake) is exceeded for a short period of time, what does that mean for the health of the individual?" asks Kellam. He doesn't know.

EPA's Evidence is Ignored

The EPA is clearly aware of its failure to control the toxic air pollution problem. Under the Carter Administration in 1979, the EPA proposed that sources of a broad range of known or strongly suspected human carcinogens be required to install

Siddarth Dube is a freelance journalist who has written on public health issues in the U.S. and India.

best available technology (BAT) pollution controls. This interim step would have cut human exposure while allowing health-based standards to be set.

Some 140 compounds were identified in the proposal; 40 were to be reviewed by December 1979. "It is both prudent and, in view of the large number of people potentially affected, important to reduce or contain emissions of known or suspected carcinogens in order to prevent future problems before they are actually observed," the EPA's air pollution control proposal argued. But this never became policy.

Robert Kellam worked on the 1979 proposal. He insists that the use of BAT is "probably a check that should be made for both carcinogens and noncarcinogens." He explains, "The instruments we have to try to assess the magnitude of the problem are quite crude. However, if we can assure ourselves that all possible sources of risky pollutants shall be controlled to this level, then we're doing pretty much the best we can. It would go a long way to mitigating the risks."

The EPA has done good internal research on toxic air pollution, sufficient to show that it is probably the most serious environmental health problem in the United States today. Yet it has not moved to control the toxic air pollution problem, nor to regulate the large chemical plants that are a primary source of hazardous air pollutants.

One reason, according to Karim Ahmed, senior scientist at the Natural Resources Defense Council, is that the EPA is a "political animal." "It's one thing to prepare background documents, and another for them to see the light of day," says Ahmed.

EPA studies show that it is probable that people are exposed to greater quantities of toxic pollutants through air than through any other medium. An EPA study done in 1981 of the top 20 toxic pollutants concluded that the average dosage for a typical person was greater from the air than from drinking water for 13 of the 16 pollutants for which the comparison could be made.

Just 15 to 45 toxic air pollutants may be responsible for over 2,000 cancer cases each year, according to a 1984 EPA study. The study notes that this is an understatement of the toxic air pollution problem, since it focuses only on cancer effects, covers a minuscule number of the known toxic pollutants, and does not deal with synergisms among pollutants. These figures also reflect exposures that may have taken place as long as 40 years ago, when production of toxic chemicals was far smaller.

A third EPA study notes that roughly half of the known and suspect toxic chemicals are emitted almost entirely from large chemical plants that produce or use synthetic organic chemicals. Motor vehicles and metal processing units are other major sources of a smaller range of toxic air pollutants, while area sources such as woodstoves, gasoline pumps, and incinerators are also important.

And since the Bhopal accident, the EPA

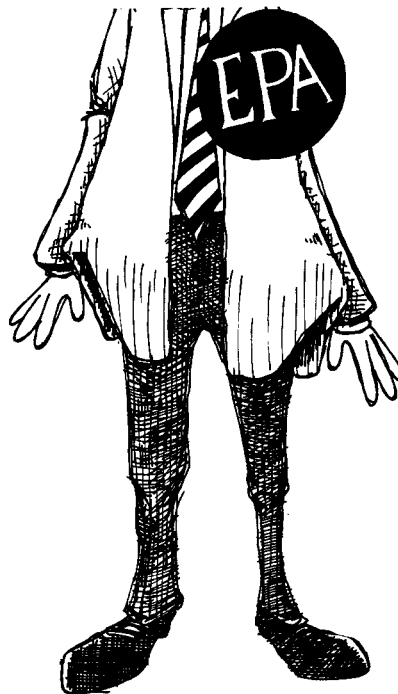
has found—through what one critic calls a "scrounging operation" in newspapers—that roughly 6,928 major accidents involving hazardous chemicals have occurred over the past five years.

Reagan Won't Regulate Toxic Air Pollution

Under the Reagan Administration, the EPA's policy branch has blocked regulatory action on toxic air pollution by claiming that there is insufficient data on which to base sound policy. The EPA derailed discussion of a 1985 Congressional bill that would have required strong best available technology use on industrial facilities by arguing that area sources were a greater health risk to communities and should be regulated first.

The EPA's decision to give greater attention to area sources of air pollution was based on an EPA study of five metropolitan areas that covered only 21 out of many thousands of toxic compounds. This suggestion was lambasted by environmental groups, state public health agencies, and major contractors to the study. The study itself carried a disclaimer that noted, "Perhaps the most definitive conclusion that can be reached in this study is that the emissions data base for air toxics is quite poor."

The damage, as far as the bill was concerned, was done. Hearings under the House Subcommittee on Health and the Environment were spent arguing whether chemical plants posed a health risk through airborne toxic pollutants. According to Congressman Henry Waxman (Democrat, California), co-author of the bill and chairman of the subcommittee, "for the EPA to insist that woodstoves and dry cleaners are the main sources of our toxic air pollution problem is incredible. They simply ignore the chemical plants around the country, which pose a serious danger to people who live nearby, suffer ill health, and are dying because of exposure to these chemicals."



As a result of such stratagems, both carcinogens and other hazardous air pollutants remain unregulated. The EPA's reliance on intricate mathematical models to prioritize risk has also allowed the agency to stall in setting exposure standards. Environmental groups have derisively termed this the "EPA's Gospel of Risk Management." Risk management allows the EPA to resort to "excessive handwringing," says Deborah Sheiman of the Natural Resources Defense Council. "They can never decide whether a pollutant is hazardous or not."

The EPA's insistence on regulating only those risks "significant" enough to warrant federal concern allows carcinogens to be emitted freely throughout the country, notes Kenneth Hagg, former president of the State and Territorial Air Pollution Program Administrators.

Moreover, it is clear that the EPA's risk management decisions are made on grossly incomplete data. According to the disclaimer to the EPA's area sources study, "There are presently no continuing and comprehensive Federal emission inventory data bases maintained on air toxics.... Few states maintain ongoing, comprehensive air toxics emission inventories."

In implementing policy, the EPA has also demonstrated its intention to avoid regulating toxic air pollution. When forced to issue regulations on pollutants through lawsuits brought by environmental groups, the agency has set standards that codify industry's existing practices.

The EPA has also consistently refused to take on federal oversight powers. The agency argues that states should regulate "localized" toxic air pollution problems. This effectively ensures that little regulation takes place: many states and local agencies are barred by state law from setting regulations more stringent than those at the federal level. And the EPA's idea of a localized problem includes acrylonitrile, a known human carcinogen emitted in 14 states.

Congress and the EPA

Congressional Democrats, considered longtime environmental supporters, have fallen in line with Reagan Administration policies. This is especially true on the toxic air pollution problem, where both Senate and House Democrats have backed Lee Thomas, the EPA administrator, in his claims that the chemical industry is sufficiently regulated, and that action should only be taken on the basis of "scientific priorities."

Democrats were ineffective in opposing the massive cutbacks made to the EPA budget during the first Reagan Administration. The EPA was "partially dismantled" during this period, says Glen Dunmire of Environmental Safety, a Washington-based environmental group. These cuts decimated the agency of its specialized staff, and closed down important programs begun in the late

1970s. The EPA is still reeling from those four years, while further cuts under the Gramm-Rudman budget "would make the current safety gap a chasm," notes an Environmental Safety report.

Because of the ideological agreement between Republicans and Democrats, Congress has been content to address only easy issues. In effect, two provisions have been passed on the toxic air pollution problem: local boards are to be set up under the reauthorized Superfund bill to plan responses to chemical accidents, while companies are required to report the amounts of toxic chemicals that are routinely emitted each year. These provisions only cover "the Mickey Mouse stuff," says an aide to Congressman Waxman.

More substantive issues have been sidestepped or blocked by Congress. Existing legislation on toxic air pollution, under the Clean Air Act, is widely recognized to be a failure because of the weak direction it gives to the EPA. According to environmental groups, state air pollution and EPA officials, new national legislation is needed to speed up the pace of identifying and setting standards on toxic air pollutants, to implement best available technology as an interim step, and to ensure that a strong federal role replaces the "patchwork regulatory quilt" at the state level.

Comprehensive data bases on routine and accidental emissions are required to regulate toxic air pollution, and routine emissions require a national monitoring scheme. Accidental risks could be reduced by attention to process safety, mandatory housekeeping measures, and by regulating land development near facilities that use hazardous chemicals.

Waxman's toxic air pollution bill would effectively address both routine and accidental risks. The bill requires federal regulations on all carcinogens, and lists 85 priority hazardous substances that would be regulated by the EPA. It contains a strong BAT policy, and requires the EPA to issue standards on toxic pollutants within short deadlines.

But it is doubtful whether such legislation will be passed soon. Waxman's bill has not moved out of the House Subcommittee on Health and the Environment. The bill is a 99-yard touchdown to its allies. But to industry, EPA administrator Lee Thomas, and most of Congress, the bill is "unworkable."

Public Interest in Air Pollution

Environmental activists supported Waxman's bill because of its strong citizen action clauses. These clauses are very different from the weak right-to-know law included in the reauthorized Superfund bill to clean up toxic hazard sites. Waxman's bill stipulates that the EPA must review any substance for regulation if petitioned to do so, and must hold a public assessment of a facility's risk if 20 people petition the

agency. The bill would also guarantee communities the right to participate in granting and enforcing permits to local facilities that work with hazardous substances.

According to Tony Mazzochi of the New York-based Labor Policy Institute, "the ability to enforce (regulations) is nonexistent today." Hands-on involvement by both workers and communities is the only way to solve the toxic air pollution problem. These groups would have to be involved in setting standards, but more importantly, in "enforcement, inspection, and citation" at the community level, says Mazzochi.

Mazzochi dismisses the existing right-to-know provisions. "Right to know is fine," says Mazzochi, "but right to know without the right to act is a very limited right indeed." According to him, there is no way that any government can effectively regulate complex environmental problems without citizen involvement. And, he notes, "it wouldn't cost a cent. Ronald Reagan's wish will come true."

On the whole, however, there has been little public concern about toxic air pollution, especially in contrast to other environmental problems that pose far smaller health risks. This is attitudinal to some degree; people are more concerned about water than air, and care more about smog than pollutants that they cannot see or smell.

In addition, notes National Resources Defense Council senior scientist Karim Ahmed, there is no united lobby on toxic air pollution because of the wide national variations. "How many places have phosgene or MIC?" asks Ahmed. "They are only of concern to those who have them in their backyards."

This suits industry well. "Industry can very easily block the development of stringent standards on toxic air pollution unless there's an imminent danger," says Ahmed. "This is true for even those substances on which debate is clear that they are dangerous."

Apart from its influence on Capitol Hill, industry's influence over communities and workers has helped it check regulations on toxic air pollution. Industries have a psychological hold over communities and workers, quite apart from political and economic clout, notes Fred Milar of the Environmental Policy Institute. "Communities desperately want to believe that they're not at risk," he claims. And, says Ahmed, "There's enough propaganda coming from both sides—that risk is large and risk is not large—that people are reasonably confused."

Regulating Scientific Evidence

Confusion in the rank-and-file has permitted the Reagan Administration, Congress, the EPA, and industry to avoid taking steps that they, at least, are clear about.

The pretense of being scientific allows

the Reagan Administration and a pro-industry Congress to cloak their negligence in respectability. Less than a fifth of the chemicals used in commerce have been tested for toxic effects and little has been gathered by the government on toxic emissions.

Given this, it is disingenuous to ask, as Congressman Don Ritter (Republican,

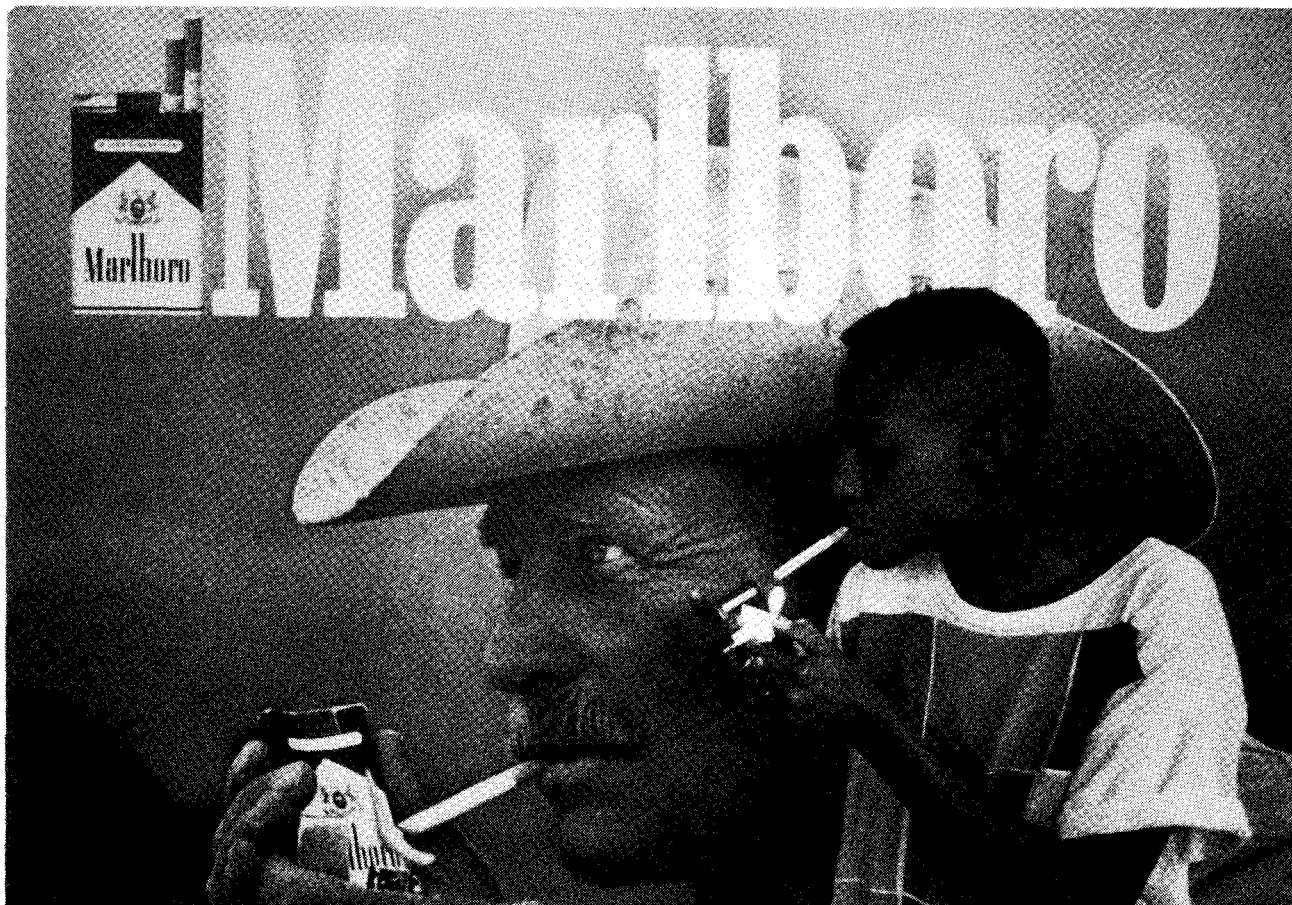
When forced to issue regulations on pollutants through lawsuits brought by environmental groups, the EPA has set standards that codify industry's existing practices.

Pennsylvania) does, that "decisions we arrive at legislatively be based on sound science and sound data." He says that supporters of legislation "should document it extraordinarily well and provide the health effects data, the exposure data, the concentration data, the medical evidences." But he doesn't urge the same standards of scientific evidence to prove the safety of chemical exposure.

In 1974, a reactor vessel that removed dioxin from 2,4,5-T and Agent Orange exploded near Patricia Frase's home in Jacksonville, Arkansas. Testifying at the hearings on Senator Waxman's bill, Frase attributed her four miscarriages, premature deaths in her family, and extensive health problems in Jacksonville to the reactor explosion and to routine emissions from the town's large chemical industry. Her views are not supported by medical research, only because the state of Arkansas has not funded any health studies and does not maintain a cancer registry.

Towards the end of the hearing, Frase was asked to comment on what she had heard. "All I really have to say is it's sickening to hear you all argue with industry when people are dying. You have no regulation for them," she answered. "Every day there are more cases of cancer, long-term and short-term, and you sit there and argue with the industry, saying, 'What are we going to pick? What chemicals are bad and what chemicals are good? What can we get on the list?'"

ADVERTISING CANCER



Photo/Pete Peru copyright 1983

As the market for tobacco products stagnated in the developed world, the tobacco industry invested huge sums to create a "need" in the undeveloped world for the neat and sexy, portable Western-style cigarette.

BY SUSAN A. MOTLEY

Chances are, the average Westerner's knowledge of the Third World is no more than a synthesis of media-supplied, impoverished images. Are the Third World's impressions of the West better founded? Of course not. Over the past 25 years in particular, the Third World has been saturated with the rich, sophisticated images of Western culture which glamorize consumption. As a result, its people have begun to modify their own habits and expectations in an effort to emulate the West.

The impact has already been significant, especially in the area of health. The multinational tobacco companies can take

Cigarette Markets Expand in the Third World

some of the credit for this since they moved so aggressively into the Third World with massive advertising campaigns. As the market for tobacco products stagnated among the countries of the developed world, the tobacco industry intensified its advertising at home while investing huge sums to help create a "need" in the undeveloped world for the neat and sexy, portable, Western-style cigarette.

It is estimated that the industry now spends \$2 billion worldwide every year on advertisements and promotions, trying to convince nonsmokers and smokers that the cigarette is both physically and socially acceptable. In the 1960s, the U.K. tobacco companies agreed to voluntary advertisement restrictions that excluded the use of

heroes, and forbade an excessive emphasis on smoking pleasure as well as the presentation of smoking as a pastime of the rich, sophisticated and successful. Regardless of any voluntary agreements or government regulations, these have actually continued to be the central themes of cigarette advertising in both developed and developing countries.

The degree to which the industry fought to keep their commercials on television and continues to fight any curtailment of advertising gives the impression that this partial restriction was a serious wound to the industry. The Tobacco Institute, a propaganda machine supported by the industry in the United States, actively seeks to perpetuate the myth that a ban actually exists. In reality, the tobacco multinationals are getting more advertising per dollar invested than ever before, and their products are still on television.

Sponsoring sporting events, such as tennis (Virginia Slims) and motor racing (Marlboro) has, as Peter Taylor describes it in *The Smoke Rings: Tobacco, Money and Multinational Politics*, "enabled the companies to associate cigarettes with healthy, glamorous and life-enhancing activities; it polishes their corporate image." Taylor also reports that "A minute of network television time for Embassy snooker (pool) costs Imperial about \$72.... A peak time network commercial lasting a minute, were the company allowed to buy it, would cost Imperial about \$203,000."

Tobacco companies get their message to the masses through sporting events and to the powerful and influential by sponsoring the arts. With relatively small contributions to performers, painters, and museums, they don't buy media coverage but prestige and respectability among those who count. This gives company executives the opportunity to make important contacts with community leaders that may prove valuable in the future.

Since 1977, Philip Morris has sponsored such art exhibits as The Vatican Collections and Two Centuries of Black American Art. Imperial has sponsored the English, Welsh and Scottish National Operas. Sports and the Arts are now dependent on the tobacco industry for sponsorship. Since a replacement benefactor would be difficult to find, it is unlikely that their leaders would favor any legislation leading to the total ban of tobacco promotions.

Nevertheless, the advertising and promotional campaigns used in the West are rather innocuous compared to those in the Third World. Even though the official position of BAT is "that local practices should not be incompatible with promotional standards in the industrial nations," they generally are quite the opposite.

Brazil, where cigarette consumption is

growing at a rate of 6% each year, provides an excellent example of the laissez faire environment available to the tobacco industry. There are no restrictions, so ads are everywhere: on television, radio, billboards. More importantly, the advertising is aggressive and blatant. It's aimed at youth, provides no health warnings, and promises success, happiness and social status.

In countries where restrictions on advertising have been initiated, tobacco companies have found ways around them. When the Sudan banned all cigarette advertising, Philip Morris altered its billboards. Cigarette packs were replaced with cigarette lighters displaying the Marlboro logo.

Tobacco companies insist that their ads are not aimed at getting people to start smoking, but instead are intended to convert existing smokers from one brand to another. The fact that billions are spent on advertising is evidence to the contrary. Also, when you consider that BAT has a complete tobacco monopoly in Kenya, yet it is that country's 4th largest advertiser, it becomes obvious that advertising must take some of the credit for the 5-10% yearly growth in consumption in that country.

Tobacco officials claim advertising in Kenya is for the purpose of informing the public. Nevertheless, the people are not informed of either the health risks, the contents of the cigarettes, or of the fact that their cigarettes probably contain twice the amount of tar as the same brand sold in a Western country.

In Pakistan, the average per capita consumption of cigarettes has increased by 8% each year since 1975, with the total now greater than 850 cigarettes per person. More than 80% of the men smoke. Very few women smoke, though their numbers are also beginning to grow. According to a World Health Organization report on "Smoking in Developing Countries," lung cancer was the fourth most common tumor in adult Pakistani men in 1973. By 1981, it had become number one. As it increases its consumption of cigarettes, the Third World will not escape the epidemic of lung and heart diseases the West faces today.

The well-organized antismoking groups active in the developed countries must continue to expand their programs to the international level. They must pressure the multinationals to at least abide by the established Western standards when promoting their product in developing countries. Finally, Third World governments must be convinced that any short-term gains from tobacco tax revenues will be obliterated by the long-term harm to health of their people.



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IT'S TIME FOR A NATIONAL HEALTH PROGRAM

BY STEFFIE WOOLHANDLER AND DAVID HIMMELSTEIN

It's time for a national health program (NHP) for the U.S. Ours is the only developed country other than South Africa which fails to guarantee affordable health care for all. An NHP providing universal, comprehensive health care free at the time of service is the only reform that can really solve the crisis in health care. An NHP would save both lives and money—and is politically feasible.

In the past decade, annual spending for health care in the U.S. has tripled to \$425 billion and now accounts for 11% of the gross national product. At the same time, the number of people denied access to care has been increasing for the first time in fifty years.

Thirty-five million Americans have no health insurance, and tens of millions more have insurance so inadequate that serious illness would lead to bankruptcy. The elderly now spend a greater proportion of their income for medical care than before the passage of Medicare. A million sick people are denied care each year because they cannot pay. More than 40% of toddlers are not fully immunized, preventable diseases such as measles are on the rise, and our record on infant mortality and other health indicators is a national disgrace.

Recent cost control programs like the Medicare DRG system have resulted in rising out-of-pocket payments for care, hundreds of thousands of empty hospital beds, the lay-offs of 300,000 health workers, and greater government

David Himmelstein and Steffie Woolhandler both practice medicine at Cambridge City Hospital and teach at Harvard and Boston Universities, respectively.

intrusion in the practice of medicine than in any other country in the world. Moreover, these "health care reforms" have each required a new army of bureaucrats to enforce the new regulations. In essence, we have been spending more and more money to assure that less care is delivered.

A national health program would improve health by making care freely available. Abolishing all financial barriers to care would save about 100,000 lives each year, according to a massive study by the Rand Corporation (though the Rand researchers dismissed this improvement as not worthwhile).

Surprisingly, a national health program would also save money by eliminating much of the massive bureaucracy in our health system and curtailing the huge profits now made from disease. In the U.S., 22% of health spending now goes for administration. In contrast, Britain and Canada devote only 6% and 8%, respectively, of their health care budgets to administration. The overgrown U.S. health bureaucracy is needed to determine patients' eligibility for insurance coverage, keep track of which patient received each aspirin tablet and band-aid, send out and pay 1.6 billion bills each year, and market lucrative services to the affluent.

We spend \$20 billion a year on insurance company overhead alone. Making health care a right under a national health program would greatly simplify billing and administration. Overall, an NHP would save at least \$45 billion annually in administration, advertising, and profits—more than enough to offset the costs of increased use of health services.

These benefits of a national health program are well proven. In both Britain and Canada, institution of NHPs led to rapid health improvements and cost

control. In both countries, the health systems enjoy overwhelming popular support, in contrast to the U.S., where polls show widespread dissatisfaction with health care. According to a Gallup poll, 60% of the American people favor a universal national health program, even if it meant increased taxes! Even a majority of doctors favor some form of NHP, though most are convinced that their colleagues oppose it.

Of course, insurance companies, profit-making hospitals, and nursing homes stand to lose under such a reform, and strongly oppose it, as do many conservative doctors. Until now, politicians have ignored the potential economic and health benefits of a national health program, but we are convinced that this can change. In Massachusetts, a recent referendum calling for an NHP won a million votes—a 67% majority. It's clear that the American people are increasingly fed up with spiraling costs and diminishing care.

Doctors are finding that health care is more and more dominated by large profit-oriented corporations with few compunctions about interfering in the practice of medicine. Even corporations outside of health care may be amenable to an NHP as a solution to their skyrocketing health bills, which have caused increasing problems in competing on world markets. (Health care is now the largest single expense for the auto companies.)

A national health program will not solve all of our health problems. It won't abolish poverty and oppression or assure good wages and satisfying jobs for health workers. Nor will it automatically shift emphasis from high-tech, cure-oriented medicine to prevention. But an NHP would save thousands of lives and ease the suffering of millions. It is a reform whose time has come.



Myths of Gender

By Ann Fausto-Sterling
Basic Books, 1986

REVIEWED BY NANCY CONNELL

In the backlash against the political and social upheavals of the 1960s, the New Right's invocation of science has been a powerful ideological weapon. The notion of scientific truth has been used to justify court decisions, legislation, and social practices which have reversed some of the progress made by women and minority groups in their struggle to achieve equality.

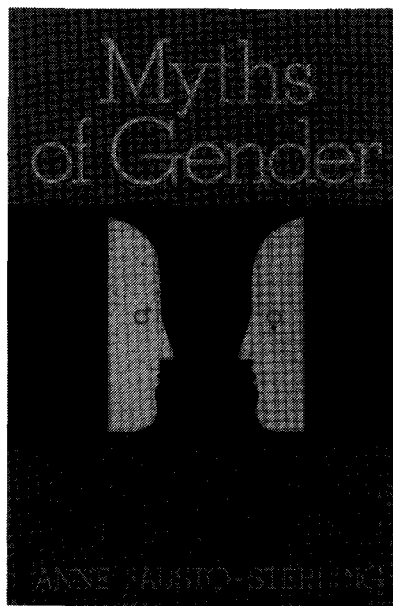
Fortunately, this period has also marked a revival of the radical science movement, which has provided a critique of these uses and misuses of science. *Myths of Gender* represents a further development in the critical analysis of techniques and scientific theories used by the Right to explain and justify sexism.

The media is continually proclaiming that scientists are "discovering" that more and more aspects of our behavior are controlled by our genes. Through "scientific proof", the media reports that math ability, genius, sexual behavior, and the existence of rape are biologically determined. Scientific proof is used to show that men are superior to women in the types of activities that have high status in our society. Even childbearing is subject to improvement by new reproductive technologies, and rational, competent "Mr. Moms" are shown to raise children better than women.

What is the nature of this scientific proof? How good is the experimental evidence for its truth? How are these experiments conceived, by whom, and where are they performed? Who pays for them? What are the methodological problems inherent in experiments that attempt to quantify such behaviors as intelligence or violence? How have the concepts of reductionism and biological or social determinism affected this research? How are the results interpreted, and how are these interpretations relayed to and subsequently reinterpreted by the press?

These are the kinds of questions that

Nancy Connell is a PhD candidate in microbiology and molecular genetics at Harvard Medical School.



Fausto-Sterling both asks and answers. *Myths of Gender* is a thorough survey and examination of theories in a few of the crucial biological fields which have a great impact on women. It appears at a time when those of us involved in the struggle against the ideology of the New Right must understand the methodological flaws used to support sexist science and politics.

An observation central to the concerns of the radical science movement is that all scientists work within a cultural and political framework, which means that interpretations of data can be influenced by this framework. For example, as Fausto-Sterling points out, a scientist comfortable with the status quo might be satisfied with weaker standards of proof for a theory that supports the social order. Some scientists recognize this, but some do not.

Fausto-Sterling, a developmental geneticist, both recognizes and examines her beliefs: she writes as a scientist who is also a feminist. She maintains that her analysis of mainstream scientific investigations is based solidly in the Western scientific tradition, but that her feminist activism offers insights that may be missed by mainstream interpretation. What's important is that she recognizes and identifies her particular bias, and exhorts all scientists to do the same.

Her book begins with a discussion of the fact that political and cultural bias in scientific research can greatly affect the outcome of experiments. This occurs because, in the context of a social system rife with inequalities, many experiments are misconceived and misinterpreted. Fausto-Sterling then submits a reassessment of a series of experimental approaches used in the construction of

biological theories of human behavior.

She examines in detail five areas which have aroused intense debate: genius and intelligence, genes and gender, hormones and female behavior, hormones and aggression, and sociobiology. She limits her attention to those aspects of these issues that pertain to the differences between men and women. Fausto-Sterling is careful to point out that the same techniques of refutation can be applied to racist theories as well.

In each area, pivotal studies are scrutinized to illustrate the history of the issue. For example, are there more male geniuses than female geniuses? Early in this century, it was believed that there is significantly more variability in intelligence among males than females. Thus, science claimed that there are more very smart men than women. Of course, this also means there are more very stupid men.

Arguments based on variability of intelligence, which were subsequently discredited, gave way in the the 1930s to arguments based on sex-related differences in cognitive skills. Little boys, it was claimed, are naturally better in math and spatial ability, and little girls are more verbal. These beliefs are still widely held today.

By tabulating the results and subsequent evaluations of these studies, Fausto-Sterling shows that there is no sound evidence to support these claims. Study after study has been disproved after being subjected to critical examination by the scientific community. Yet much of this discredited work is still quoted and referred to in textbooks and popular journal articles. Why is so much faulty research still in favor?

After discussing sex and intelligence, Fausto-Sterling focuses on hormones and behavior, the field in which she is actively involved. Here again, she documents the faulty reasoning, insufficient data, and poorly designed experiments which characterize much of the research purporting to show that sex hormones control social behavior.

The final analytical section of the book, "Putting Woman in (Her) Evolutionary Place," addresses the field of sociobiology and its attempts to provide biological explanations for a variety of human behaviors. Fausto-Sterling chooses to discuss the sociobiological studies of rape (for more information, see the article "Sociobiology and Rape" by Val Dusek in the Jan/Feb 1984 issue of *SftP*). Male scorpionflies, ducks, rats, and by inference, humans may engage females in forced copulation as a technique to "maximize their inclusive fitness." But Fausto-Sterling

discusses experimental flaws in all of the animal studies, systematically rendering each study inconclusive.

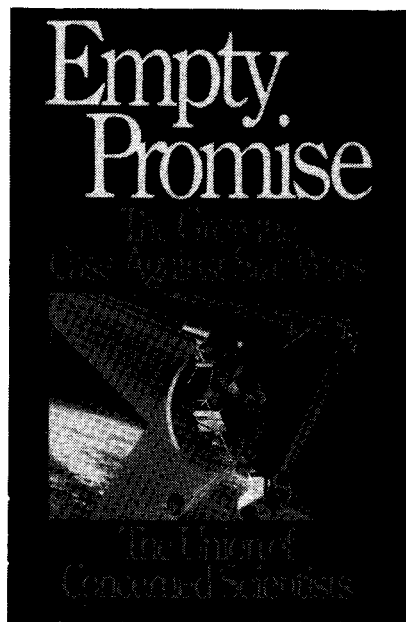
In her concluding chapter, the author sums up the numerous studies she has dissected in the book by presenting a composite view of the average human female: "She is a skilled housewife; but should she enter the workforce, she will remain at the bottom or intermediate levels of the business, government, or professional hierarchy. As a result she will be poor, failing to earn a status worthy of cash rewards because she is not good at math; she may talk too much and too superficially; she is a potential victim; and she is unaggressive except when caught in the throes of some hormonal imbalance which may then turn her to irrational emotional outbursts and even, in extreme cases, to violence. Furthermore, what creative potential she has left over from child rearing peaks relatively early in her life cycle—about fifty years of age—and thereafter she slides slowly downhill physically, emotionally, and intellectually."

The composite view of the human male, while not entirely complimentary, is certainly more likely to succeed, unless he is unfortunate enough to be a member of certain racial groups. The important and insidious point is that because sex-related differences are innate, society "emerges as just and fair. There is no significant job or wage discrimination. Ability determines income distribution; poverty results from individual incompetence."

Methodological advances, such as a more sophisticated use of reductionism, are making their way into science. Fausto-Sterling suggests, however, that methodological improvements are not always sufficient to overcome the flaws in some areas of scientific research, and that these areas should be abandoned.

For example, sex-related differences in cognition or brain lateralization, if they exist at all, are most likely to be smaller than variations between individuals of the same sex, and will not be detectable. So these studies aren't worth pursuing. But there is much more to be learned in other areas, such as studies of menstruation and menopause. One hopes that new attitudes towards science, like those of Fausto-Sterling, will inform this research so that it will stand up to critical scrutiny.

Science uses the results of scientific investigation to maintain common social prejudices. So it is essential that we understand the basis of scientific claims of racial or sexual superiority. Such science must not be allowed to "divert attention from some of the most pressing political issues of our time."



Empty Promise

The Growing Case Against Star Wars

By The Union of Concerned Scientists
 Edited by John Tirman
 Beacon Press, 1986

REVIEWED BY GARY KEENAN

On Friday, the day after Thanksgiving, as I walked past the Cambridge Public Library, I saw a sight both common and shocking. On a park bench sat two men, both middle-aged, dressed in the uniform of the urban poor: layers of sweatshirts and sweaters, baseball caps, soiled trousers, sneakers. Each man had before him a shopping cart containing his survival kit: cardboard bedding, blankets, deposit bottles and cans.

In the lap of the younger of the two men, a boy about eight years old sat curled up, clinging to the plaid sleeve of the man's coat. There was an indescribable blankness in the child's eyes, a look one sometimes sees in older eyes, a look

Gary Keenan is the business manager of Science for the People.

beyond hope or pleasure or security, a look usually acquired from decades of malnourishment, drugs, and violence.

When I was young, my parents used to tell me stories of how the United States saved Europe and Japan after World War II. We gave our former enemies millions of dollars in food, clothing, shelter, and economic assistance, so these people could build a new, more democratic system from a position of dignity and purpose.

This contrasted to their tales of Russia and the nations it enslaved, where children spied on their parents for the secret police, where people dressed in rags, and the poor had to go through garbage cans to find food. This last image was the most powerful for me. If America seemed to be about anything in the fifties and sixties, it was about consumption—endless demand pursuing limitless supply. And hunger, the unfulfilled demand, seemed foreign, threatening, unAmerican.

Sometimes when I walk the streets of Cambridge, I feel transported to that other country, unAmerica, a country of similar dimensions and yet different. Where Washington and Jefferson once stood with men who risked their sacred honor to redefine liberty, there now stands a retired movie star, of little or no discernible intelligence, whose hair-dyed, rouged, voice-modulated image is the logo for the latest marketing campaign: the Strategic Defense Initiative.

SDI, affectionately known as Star Wars in the print and broadcast media, is the most ambitious and arrogant scientific program ever enacted. As a waste of enormous resources and as a preparation for nuclear war, Star Wars has provoked widespread dissent within the scientific community over the feasibility and wisdom of the program.

The Union of Concerned Scientists, Computer Professionals for Social Responsibility, the Federation of American Scientists, Physicians for Social Responsibility, and other such groups have painstakingly detailed the shortcomings of trying to protect civilian populations from nuclear attack. If knowledge truly were power, Star Wars would have remained a movie, just one more funny story Reagan told one day on television.

Empty Promise is a collection of essays that brings together many of the arguments against Star Wars. The technological problems of destroying five to ten thousand warheads, a video game where one miss may mean more devastation than the U.S. has suffered in any armed conflict, are addressed from several perspectives.

Robert Zirkle looks at the command and

control network necessary for Star Wars, reminding us that it is a system, not a single weapon. Even if space-based lasers, antisatellite warheads, and giant mirrors perform perfectly in labs and field tests, making such technologies a viable military strategy is largely dependent on the ability to control and direct such technologies in an environment of war or near-war tensions. Zirkle reminds us that the weapons and command systems will continue to evolve as research proceeds, so there are only theoretical systems to criticize.

But the systems for defensive weapons will be at least as complex as those for our offensive weapons. And those latter systems continually malfunction, with incidents of false attack warnings, accidental bomb droppings and missile launchings. We're kept in a state of grace, where the occurrence or nonoccurrence of a nuclear war is a matter of accident—or chance, if one is pessimistic. Zirkle shows how, in an international crisis, the complexity of a Star Wars command system will undermine stability and may itself precipitate a nuclear exchange.

Other technical objections are familiar to

those following the controversy. Greg Nelson and David Redell examine the demands placed on computer software capabilities by Star Wars, from error monitoring within a system to the lack of reliable, real-conditions testing. ASAT-SDI connections are discussed by John Tirman and Peter Didisheim. Star Wars will rely heavily on satellite systems, which are more vulnerable than earth-command systems. This encourages Soviet deployment of antisatellite weapons, which is then used as evidence by Reagan to urge support for SDI. And SDI transforms space into a field of battle, the ultimate power of Star Wars.

Too often the technical objections to Star Wars are dismissed as faint-hearted pessimism. Whoever thought the atom bomb possible? Or a cure for influenza? Or human flight? While much more is at stake with Star Wars, the fact that the technology may not work is not really central. If it did work, would that change the foolishness and cruelty of Star Wars? I think not. The essential questions raised by Star Wars are political, and as the technical problems become more apparent to more people, I hope the focus of the debate shifts toward the political impact of SDI.

Empty Promise includes several essays on this dimension of Star Wars. John Tirman and Richard Garwin, in separate essays, recount the diplomatic and political fallout from Reagan's venture. Tirman summarizes the history of the conception of Star Wars: its initial appropriations fight in Congress, its link to classic anticommunism, and its place in our current military ideology as a guarantor of first-strike capability. Garwin looks at likely Soviet countermeasures, both diplomatic and military, which show how easily the purported goal of a nationwide nuclear umbrella could be circumvented.

Peter Clausen details the havoc SDI has caused arms control. As long as the U.S. pursues such a defensive system, the Soviets are unlikely to agree to substantial reduction of warheads, since launching many warheads is one way to overwhelm a space-based defense system. It may also drive the Soviet Union to depend less on land-based missiles and to develop cruise missiles, bombers and submarine-launched missiles that are beyond the scope of SDI.

Just what that scope is presents more problems. Is Star Wars a passive shield over

CONTINUED ON PAGE 32

Which Way Should the World Turn?

TOWARD PEACE ON EARTH OR WAR IN THE HEAVENS?

► **T**he world stands at an historic crossroads. How are we to make sense of the road signs—one pointing toward Star Wars, the other toward negotiated arms reductions?

Two new releases from the Union of Concerned Scientists are designed to help those who wish to examine Star Wars and its implications.

THE FALSE FRONTIER.

This new UCS video production questions whether Star Wars is a worthy goal for American technological ingenuity. It graphically demonstrates the fallibility of the defense shield proposal, including its vulnerability to countermeasures. 1986. 11 minutes.

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—former President Jimmy Carter

Beacon Press, 1986. 238 pp. Paperback, \$7.95.

Order both from: Union of Concerned Scientists ■ Publications Dept. P ■ 26 Church Street ■ Cambridge, MA 02238

Check payable to: Union of Concerned Scientists

The Last Extinction

edited by Les Kaufman and Kenneth Malloy

MIT Press, 1986, \$16.95 hardcover

Are we, as a world, in the midst of a mass extinction of life? Is this caused by the actions of humanity? Unfortunately, the answer to both these questions, this collection of essays indicates, is yes.

Perhaps the best book on the issue since Paul and Anne Ehrlich's *Extinction* (Ballantine, 1981), *The Last Extinction* views the incredible loss of biological diversity that is occurring from several distinct yet interrelated perspectives. Les Kaufman's introductory essay not only hints at the magnitude of the loss, but also makes the case for the beauty and wonder of what is being destroyed.

The next two of the book's six essays, by David Jablonski and Ghillean T. Prance, place extinction in historical perspective, looking at past extinctions and their effects. They also relate extinction to the devastation of the planet's tropical rain forests—specifically the Amazon Basin, illuminating the insidious loss of habitat, what the Ehrlichs call "indirect endangering." The third essay, by James D. Williams and Ronald M. Nowak, explores the species we have already lost in North America.

The fifth essay, by Thomas J. Foose, tackles the problems inherent in trying to conserve and preserve endangered species in artificial environments like zoos. This essay contains an incisive analysis of captive breeding—a point of no little controversy among environmentalists. The concluding essay, by David Ehrenfeld, looks at life in the next millennium and asks, "Who will be left in Earth's community?" References, suggestions for further reading, photographs, and a list of organizations working on the issue make this book an invaluable resource for those who want to do something about saving life on this planet.

But *The Last Extinction* is not a complete expose of the issue. For example, it lacks significant discussion of the imperatives of the world's economic systems and their role in the destruction of nature, or of the role of debt and poverty in Third World countries in the destruction that is occurring there. However, the book raises what may be the ultimate issue: the relationship of the human species to other life on Earth.

As Ehrenfeld indicates, the "dream of power and control" over nature may be the primary force that got us into our present

situation, but the transformation of that dream is also possible, from "one of quantity, production, consumption, monumental waste, and the idiot's goal of perpetual growth to one of quality, equilibrium, durability, and stability." How to achieve that transformation? Les Kaufman may have suggested the first step: "The key to the preservation of biological diversity everywhere on Earth—in a rain forest, a coral reef, an estuary, a prairie, a city—is that people must stop thinking of all other life as the green blur out the window of a speeding train."

—Joseph Regna

Toxics and Minority Communities

prepared by Melia Franklin

Alternative Policy Institute of the Center for Third World Organizing, Oakland, CA, 1986, \$5.95

What do Blacks in Emelle, Alabama and Warren County, North Carolina, Native Americans in Arizona and the Dakotas, and farmworkers in California and Maryland have in common? According to *Toxics and Minority Communities*, a lot. First, all are people who have suffered from American-style discrimination and racism. And second, all are victims of another curse: toxic substances—hazardous waste, radioactive tailings, and pesticides, respectively.

As a quarterly "Issue Pac" from the Center for Third World Organizing, this guide is by no means a complete dissertation on how these and similar groups (like workers, people in the Third World, and women) have borne the brunt of the damage from toxic substances. However, it is a solid introduction to the issue, including information on the health effects of hazardous waste, uranium tailings, and pesticides, and their impact on particular communities and populations in the U.S. It discusses the role of government in exacerbating the toxic-substance problems faced by minority communities, and shows some steps and actions people have taken to combat the toxic insult to their lives.

The booklet includes a bibliography on each topic, resources, and organizational contacts. Two short concluding articles on lead poisoning of children and Third World dumping serve as a call, based on shared problems, to establish bonds between victims here in the U.S. and those on the periphery of the empire. This bonding may be particularly important if two of the primary problems—capitalist imperialism and racism—are to be overcome.

—Joseph Regna

Agricide

The Hidden Crisis that Affects Us All

by Michael W. Fox

Shocken Books, 1986, \$7.95

This book provides more than you may want to know about the raising of the food you eat. It explores livestock production in depth: factory farms, where animals are kept in inhumane and unsanitary conditions; the use and consequences of antibiotics and hormones in feed; the effects of pesticides and fertilizers on the grain that is produced; the economic and ecological effects of high-capital, low-labor intensive farming, both in the U.S. and the Third World—and more.

For those who are interested in changing their eating habits, but not ready to give up all commercial meat, one chapter provides a ranking of livestock production methods in terms of the suffering the animals undergo—with veal and eggs produced by the most inhumane methods, and poultry and dairy products the result of the least suffering.

The book suggests both short-term individual and long-term social alternatives to present farming methods, and advocates that grain production should go to feed starving people rather than fattening livestock. Fox also makes a novel case for raising wild animals adapted to their specific regions for food, rather than raising domesticated stock that may upset the ecology of an area, pointing out that native animals, being resistant to local diseases and adapted to local plants, would not need to be given hormones or special feed to ensure their survival.

He argues for a decentralized, diversified agriculture that is not dependent on chemicals or fertilizers for productivity, and that treats land as a sacred trust to be preserved.

—Mike Wold

Darwin's Metaphor Nature's Place in Victorian Culture

by Robert M. Young

Cambridge University Press, 1985

This collection of six essays deals with the relations between Darwin's thought and the rest of Victorian culture. The theory of natural selection had a profound impact on social theory, psychology, and intellectual life in the nineteenth century. At the same time, Darwin's thought was very much a part of its Victorian context; it carried

political and theological implications that modern orthodox histories of science ignore.

Intellectuals from diverse areas of knowledge entered the debate on the place of humanity in nature, and Darwin's ideas were brought to bear on questions as far from biology as the basis for morality, the relations between "races", and the existence of God.

Young criticizes traditional approaches to the study of the debate and their separation of history from politics and ideology. He argues that "science is too often and too uncritically seen as fundamentally progressive; it needs to be viewed in the context of our lives and of contending class forces," especially in a period in which "biotechnology is harvesting and commercializing the long-term fruits of Darwinism."

—Mike Wold

Power Struggle The Hundred-Year War Over Electricity

by Richard Rudolph and Scott Ridley

Harper & Row, 1986, \$19.95 hardcover

Richard Rudolph and Scott Ridley want us to know about the history of the ownership and regulation of electric generation in the United States so that we are not condemned to repeat it. They argue convincingly that current struggles between nuclear power advocates and those favoring conservation and renewable resources are only the latest battle in a century-old war over who should control the provision of electricity in the U.S.

From the beginning, public and private forces have battled for control of electric generation. In most European countries, electricity came to be a publicly provided commodity, like water or mail services. In

the United States, however, large, private companies have time and again beaten back challenges by those seeking democratic control over electricity production, aided in no small part by their allies in government regulatory agencies and on Wall Street.

Power Struggle neatly illuminates a cyclical pattern in energy history: power concentrated in the hands of private utilities leads to gross abuses by the electric industry, which leads to pressure for public control, which is beaten back by more abuses in the form of massive payoffs of government officials and propaganda campaigns.

The book traces the growth of private utilities in the late 19th century and the invention of state regulation by the utilities themselves in response to the rapid growth in the number of public power systems in the early 20th century. Advocates of democratic control of electric generation gained some ground with the breakup of massive utility holding companies during the New Deal, but the advent of nuclear power after World War II re-energized the industry and began a trend toward increased centralization of generation and transmission. In the 1970s, however, spiraling costs and environmental concerns sparked citizen rebellion, which the industry is now trying to damp with facially appealing regulatory changes and inflammatory rhetoric from Wall Street.

Several themes pervade the book, each illustrated with numerous incidents from throughout the last century. One is the crucial role of Wall Street financiers in protecting private utilities, long considered "dividend machines" for investors. Another is the impossibility of effectively regulating privately owned utilities, given their political savvy and power. A third theme is the role of politics in determining

the technology of choice for electric generation.

The authors are clearly scared that advocates of public power, conservation, and renewable resources are too naive about the political context of their struggles. Any future transition to decentralized power production, they argue, depends on the forces of the marketplace and public opinion, two forums which the industry has successfully manipulated to its advantage over the last hundred years.

Similarly, Rudolph and Ridley fear that Amory Lovins-style energy optimists place too much faith in technological omnipotence. Because politics shapes technology choice, and not vice versa, the authors reject the "popular hope...that solar and renewable energy technology will provide the opportunity to break down monopoly control and give birth to a new competitive, decentralized electric power industry over which consumers will have greater voice."

Power Struggle certainly drives home its point that the issue for decentralized energy advocates is one of control—to the point where the rhetoric is sometimes a bit repetitive. Nevertheless, it is eye-opening to read about debates in the 1940s over nuclear power which sound exactly like today's discussions about the need for democratic control over energy decision-making and the link between nuclear weapons and civilian nuclear power. *Power Struggle* forces the reader to ask why these anti-nuclear arguments failed four decades ago and what must change if they are to succeed this time around.

—Stephanie Pollack

The False Frontier

by Union of Concerned Scientists

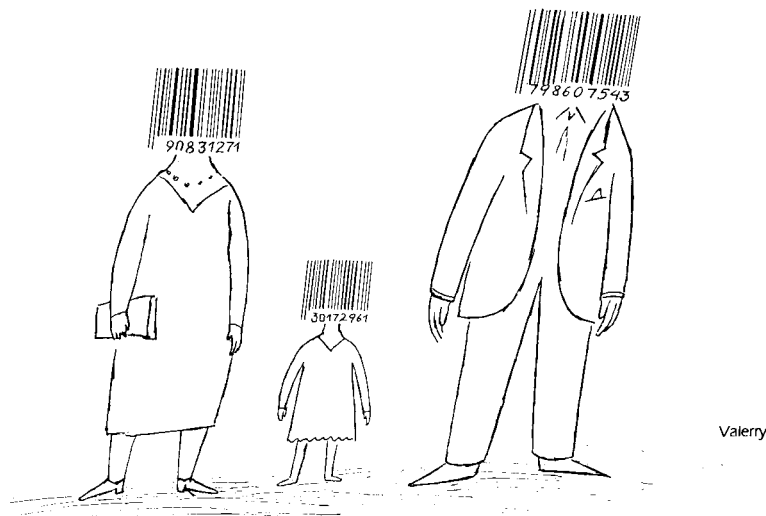
UCS, 26 Church St., Cambridge, MA 02238.

Videotape: \$20, slide show and sound tape: \$15.

The False Frontier, an 11-minute videotape produced by UCS, highlights the political nature of Star Wars. The narrator encourages us to look past the technology to the question of whether Star Wars should be a national priority. The dangers it poses to international security, our economy, and our own defense are outlined in terms accessible to students of high school age.

The tape is a good introduction to the issues surrounding SDI. It falls short on practical steps people can take to oppose Star Wars, but implies that Reagan and like-minded Republicans should be restrained by voting and lobbying efforts.

—GK



IMMUNOLOGY

CONTINUED FROM PAGE 17

38. Gallo, R.C. "HTLV-III: Untangling the Retroviral Origins of the AIDS Paradigm." *Advances in Oncology*, Vol. 2, 3-10, 1986.

39. Flemming. "HTLV: Try Africa." *Lancet*, 1983, ii:69.

40. Catovsky, D., et al. "Adult T-Cell Lymphoma Leukemia in Blacks from the West Indies." *Lancet*, 1982, i:639-43.

41. Gallo, R.C. 1980. HTLV-III... op. cit.

42. Harper, M.E., et al. "Concomitant Infection with HTLV-I and HTLV-III in a Patient with T8 Lymphotropic Disease." *New England Journal of Medicine*, 1986, 315:1073-78.

43. Wong-Staal, F., et al. "Genomic Diversity of Human T-lymphotropic Virus Type III (HTLV-III)." *Science*, May 1985, 230:759-62. Benn, S. "Genomic Heterogeneity of AIDS Retroviral Isolates from North America and Zaire." *Science*, 1985, 230:949-51.

44. Hahn, B.H., et al. "Genetic Variation in HTLV-III/LAV Over Time in Patients with AIDS or at Risk for AIDS." *Science*, 1986, 232:1548-53.

45. Serwadda, et al. "Slim Disease: A New Disease in Uganda and its Association with HTLV-III Infection." *Lancet*, 1985, ii:849-52.

46. Bayley, A.C., et al. "HTLV-III Serology Distinguishes Atypical and Endemic Kaposi's Sarcoma in Africa." *Lancet*, 1985, i:359-61. Downing, R.G., et al. "African Kaposi's Sarcoma and AIDS." *Lancet*, 1984, i:478-80.

47. Susser, M. *Causal Thinking in the Health Sciences: Concepts and Strategies in Epidemiology*. Oxford Press, 1973. Rothman, K.J., "Causes." *American Journal of Epidemiology*, 1976, 104:587-92 (see diagram, p. 589).

48. Gonda, M.A. "The Natural History of AIDS." *Natural History*, May 1986, 78-81.

49. Gonda, M.A., et al. "Sequence Homology and Morphologic Similarity of HTLV-IV and Visna Virus, a Pathogenic Lentivirus." *Science*, 1985, 227:173-77.

50. Gonda, M.A. 1986, *The Natural History...* op. cit.

51. Kanki, P.J., Alroy, J., Essex, M. "Isolation of T-lymphotropic Retrovirus Related to HTLV-III from Wild-Caught African Green Monkeys." *Science*, November 1985, 22:951-54. Kanki, P.J. "Serological Identification and Characterization of Macaque T-Lymphotropic Retrovirus Related to HTLV-III." *Science*, June 7, 1985, 228 (4704):1199-201.

52. Ibid.

53. Letuim, L.V., et al. *Proceedings of the National Academy of Science USA* 80, 2718 (1983).

54. Hendrickson, R.V., et al. "Clinical Features of Simian Acquired Immunodeficiency Syndrome (SAIDS) in Rhesus Monkeys." *Lab Animal Science*, April 1984, 34 (2):140-5.

55. Beldekes, J. "African Swine Virus and AIDS." *Lancet*, March 8, 1986, 1 (8680):564-65.

56. Martins, C.V., Lawman, M.J.P. "African Swine Fever and AIDS." (Letter) *Lancet*, 1986:1504-5.

57. zur Hausen, H. "Human Genital Cancer: Synergism Between Two Virus Infections or Synergism Between a Virus and Initiating Events?" *Lancet*, 1982, ii:370-72.

58. Hirsch, M.S., Shooley, R.T., Ho, D.D., Kaplan, J.C. "Possible Viral Interactions in Acquired Immunodeficiency Syndrome (AIDS)." *Journal of Infectious Disease*, 1984, 6:726-31.

59. Gravel, M., et al. "Transmission of Simian Acquired Immunodeficiency Syndrome (SAIDS) with Type D Retrovirus Isolated from Saliva or Urine." *Proc. & Soc. Exp. Bio. Med.*, Dec. 1984, 177 (3):491-4.

60. "AIDS" (Editorial). *The Tropical Doctor*. Vol. 15, No. 1, Jan. 1985.

61. Bigger, R.J., et al. "Serioepidemiology of HTLV-III Antibodies in a Remote Population in Zaire." *British Medical Journal*, March 1985, 290:810.

62. Barnes, D.B. "Grim Projections for AIDS Epidemic." *Science*, 1986, 232:1589-90.

63. Kerr, R.A. "Greenhouse Warming Still Coming." *Science*, 1986, 232:573-4.

ARGENTINA

CONTINUED FROM PAGE 9

prosecuted for inhumane actions.

The example of Argentina's pursuit of justice has spread beyond its borders. In Guatemala, human rights groups, despite the murders of two founding members in 1985, march regularly to demand the return of their relatives' bodies. In Chile, the country's medical association has suspended doctors who participated in state-tolerated torture.

Even while torture and disappearances persist, and 200 complaints of torture have been filed in court, military physicians in Chile have approached the medical association to report that they had been ordered by superiors to examine or treat torture victims. These physicians have asked for the association's support in informing the military that they would not cover up torture.

This past December, a second team of forensic scientists and students, including Clyde Snow and Argentinian students trained by him, trained a group of scientists and students in the Philippines in exhumation and skeleton-identification techniques, and in methods of determining both cause of death and evidence of torture.

Currently, 619 Philippine citizens are listed as missing, most disappeared during 1984 and 1985. Reports of torture were prevalent throughout Ferdinand Marcos's regime. The AAAS-sponsored delegation was invited by the new Philippine president, Cory Aquino, and human rights groups such as the Families of the Involuntarily Disappeared and Medical Action Group.

The movement to use science to uncover the disappeared and to track their torturers and murderers is growing. "The military has a network of collaborators all over the world," says Mary Claire King. "We can set up networks that are just as strong."

FOR MORE INFORMATION

1. NOVA, the public television science series, premiered "The Search for the Disappeared" on October 14, 1986 (check local PBS listings for repeats), which describes forensic and genetic methods used to identify Argentina's disappeared. A transcript of the one-hour show is available for \$4 from NOVA, Box 322, Boston, MA 02134. A video cassette or 16 mm. film of the show is available from Coronet Film and Video, 108 Wilmot Rd., Deerfield, IL 60015 (1-800-621-2131).

2. Amnesty International. *The Missing Children of Argentina: A Report on Current Investigations*. Amnesty International USA, July 1985.

3. "Special Report: The Medical Profession and the Prevention of Torture." *New England Journal of Medicine*. October 24, 1985, 313:1102-1104.

4. Simpson, John and Jana Bennett. *The Disappeared and the Mothers of the Plaza: The Story of the 11,000 Argentinians Who Vanished*. St. Martin Press, 1985.

5. "Human Genetics and Human Rights: Identifying the Families of Kidnapped Children." *American Journal of Forensic Medicine and Pathology*. December 1984, Vol. 5, No. 4, pp. 339-347.

6. "The Investigation of the Human Remains of the 'Disappeared' in Argentina." *American Journal of Forensic Medicine and Pathology*. December 1984, Vol. 5, No. 4, pp. 297-299.

REVIEW: EMPTY PROMISE

CONTINUED FROM PAGE 29

our cities? Is it a partial shield over our missile ranges? Is it the vanguard of an essentially offensive strategy? Is it a bargaining chip, or not? As long as the Reagan administration and its allies hedge on such questions, meaningful arms control negotiations will remain at a standstill.

Empty Promise concludes with a chapter which asks, "Is Star Wars Dead?" The damage it will do to our European alliances and to the arms control agreements already negotiated, the sheer improbability that many of the proposed weapons will actually work, and the economic burden of the research and development do not augur well for the long-term chances of Star Wars. Like another costly and foolish investment in the technological treatment of a political problem, the Vietnam War, sooner or later the price will be too high.

But Star Wars, like Vietnam, represents an opportunity to mobilize popular

opinion and to promote critical discussion on the direction of technological development. *Empty Promise* can play a valuable part in this by giving lay readers a clear analysis of the scientific and political folly of Star Wars. With such information, we can press beyond questions of mere feasibility.

Should we arm ourselves to the heavens while our neighbors dress in rags and eat garbage? How did this country become so accustomed to lies and genocidal fantasies put forward as public policy? How can the Reagan administration persist in its course when the scientific community and public sentiment clearly favor arms control and reduced military spending? If we can pursue such questions with tenacity and assert some measure of democratic control over technological development, perhaps Star Wars' empty promise will serve as a catalyst for a more humane formulation of science and technology.



CONTACTS

NATIONAL OFFICE: Science for the People, 897 Main St., Cambridge, MA 02139. (617) 547-0370

CALIFORNIA: Bay Area Chapter, c/o Dave Kadlecik, Box 390871, Mountain View, CA 94039. (415) 960-3639

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FLORIDA: Bob Broedel, Progressive Technology, Box 20049, Tallahassee, FL 32316. (904) 576-4906

IOWA: Paul C. Nelson, 604 Hodge, Ames, IA 50010. (515) 232-2527

MARYLAND: Pat Loy, 3553 Chesterfield Ave., Baltimore, MD 21213

MASSACHUSETTS: Boston Chapter, 897 Main St., Cambridge, MA 02139. (617) 547-0370

MICHIGAN: Ann Arbor Chapter, 4318 Michigan Union, Ann Arbor, MI 48109. (313) 761-7960. Alan Maki, 1693 Leonard St. N.W., Grand Rapids, MI 49504

MISSOURI: Peter Downs, 4201 A Russell, St. Louis, MO 63110

NEW HAMPSHIRE: Val Dusek, Box 133, Durham, NH 03824. (603) 868-5153

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NORTH CAROLINA: Douglas Bell, 2402 Glendale Ave., Durham, NC 27704. (919) 471-9729

OREGON: Sheila Smith, 925 NW Merrie Dr., Corvallis, OR 97330

RHODE ISLAND: Carolyn Accola, 245 President Ave., Providence, RI 02906. (401) 272-6959

TEXAS: Ed Cervenka, 3506 Manchaca #211, Austin, TX 78704. (512) 447-9481

VERMONT: Steve Cavrak, Academic Computing Center, University of Vermont, Burlington, VT 05405. (802) 658-2387; 656-3190

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DENMARK: Susse Georg and Jorgen Bansler, Stigardsvej 2, DK-2000, Copenhagen, Daneland 01-629945

EL SALVADOR: Ricardo A. Navarro, Centro Salvadoreno de Tecnologia Apropiada, Apdo 1892, San Salvador, El Salvador, Central America

ENGLAND: British Society for Social Responsibility in Science, 25 Horsell Rd., London N5 1XL, England. Tel. 01-607-9615

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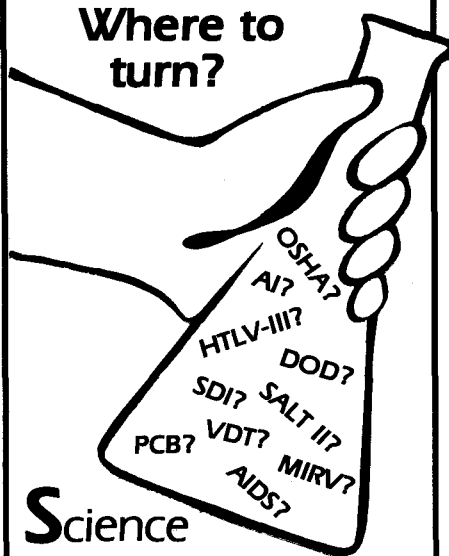
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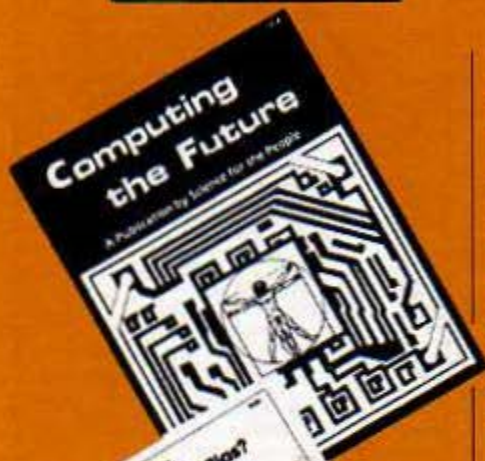
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