SCIENCE FOR THE PEOPLE

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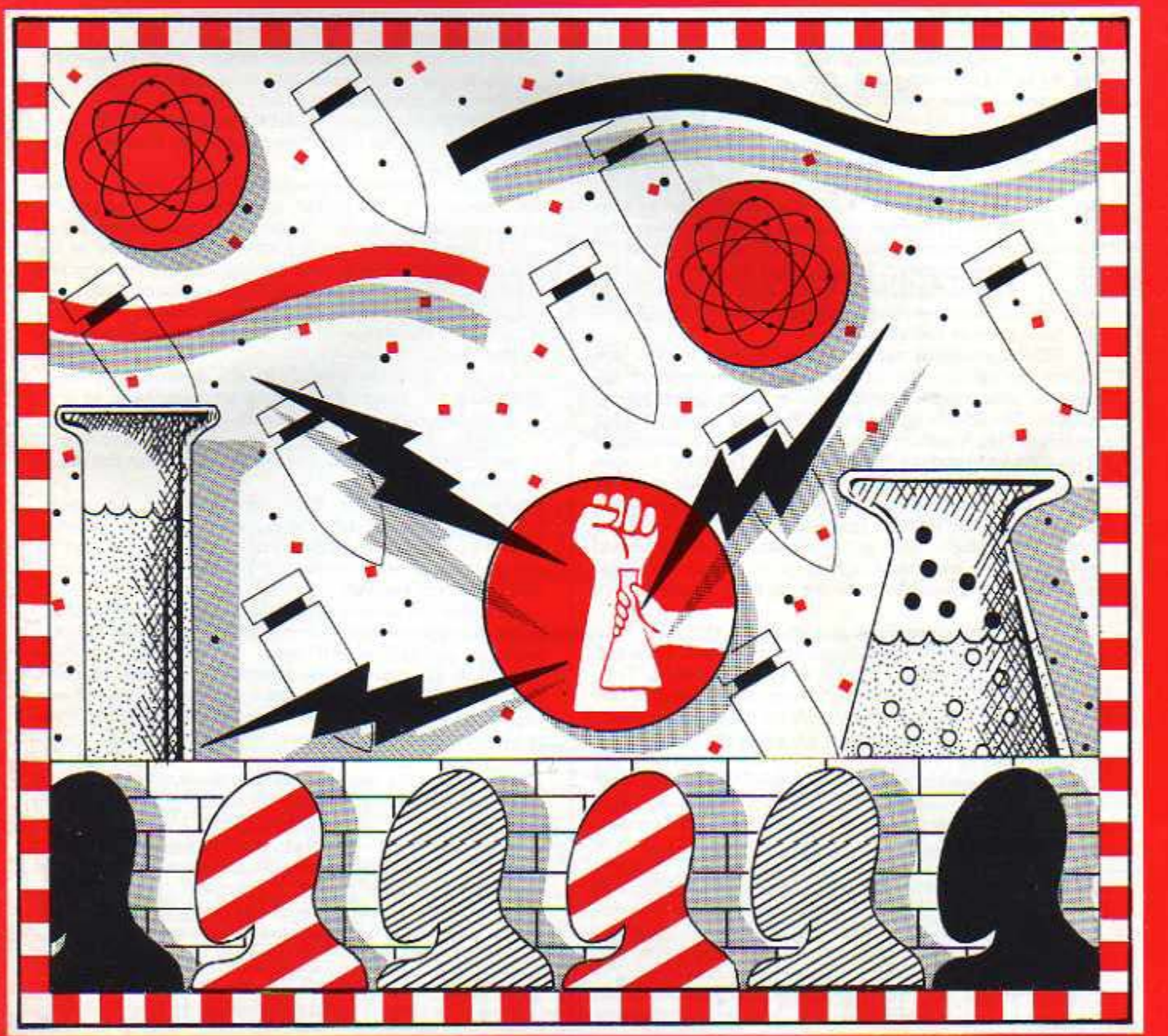
OUR 15TH ANNIVERSARY



TOWARDS A SCIENCE FOR THE PEOPLE

about this issue

Celebrate! Science for the People is 15 years old! Fifteen years is an impressive age for a collective organization with a long history of radical activities. Few other national organizations have survived the 1970s and maintained a radical perspective. In the course of editing this issue, the editorial committee has discussed both the changes and the startling similarities between the Science for the People of today and that of 1968.

Over the years, our commitment to an alternative, humane "people's science" has grown even stronger. The peace and anti-nuclear movement, the women's movement, and the ecology movement all reflect an increasing awareness of the need to make science and technology responsive to people's needs.

At the end of the 1960s, in the midst of increasing protest against the involvement of North American scientists and engineers in the Vietnam war, a group of California "Scientists for Social and Political Action" (SSPA, later SESPA, with an "E" for engineers) decided to publish a national magazine, establishing a communications network among critics of American science policy.* SESPA called it "Science for the People," reflecting the desire to build a movement that would fight against science-supported racism, sexism, and exploitation both at home and abroad.

SESPA protested against the antiballistic missile, and against the participation of scientists and engineers in the design of antipersonnel weapons and counterinsurgency technologies. The Science for the People Teaching Group attended meetings of the American Association for the Advancement of Science (AAAS) and the National Science Teachers' Association, arguing that science was not "neutral," that much of what was done in the name of value-free science was *political.* In the Boston area, the SftP Teaching Group criticized the way science was taught, and published alternative curriculum materials like *Feed, Need, Greed,* a workbook on food, resources, and population for use in high school science classes.

At the International Genetics Congress in 1973, SftP criticized the scientific racism of Jensen and Hernstein, advocates of IQ as a measure of intelligence; in 1974, the Genetic Engineering Group of SftP in Boston succeeded in bringing a halt to Harvard University research designed to screen newborn males for XYY chromosomes which supposedly resulted in "inborn criminal tendencies." Science for the People has raised its voice against biological determinism, and against all attempts to justify inequalities of race, sex, or class as somehow "natural" expressions of the human brain, hormones, or genes.

Over the years, the style of SftP has changed considerably. Early issues of the magazine were confrontational in tone. Establishing a wider popular base was often difficult due to an overlay of rhetoric that bordered at times on "preaching to the converted." Organizational meetings often turned into long political discussions about this or that correct "line." In Boston, meetings were followed by heavy "self-criticism" sessions, where people poured out their guilt about dominating the meeting's conversation.

In recent years, Science for the People has become more pluralistic, and more concrete in its political perspective. There is more humor in the organizational meetings, and more of an emphasis on the need to implement concrete political agendas. Science for the People, and the progressive science movement generally, have been dramatically affected by both feminism and ecology. The focus has shifted somewhat away from theory, and more toward concrete exposes and practical critiques.

We have called this issue "Towards a Science for the People"—the same title used in an important booklet published by SftP in 1971.** In the booklet, the authors outlined an agenda for Science for the People, comprised of six broad areas of focus:

- technical assistance to movement organizations and oppressed people;
- foreign technical help to revolutionary movements;
- people's research;
- exposes and research into the existing power structure;
- ideological critiques and confrontations;
- demystification of science and technology.

When we looked over our articles for publication in this issue, we could not help but realize how relevant and applicable these goals remain today.

The article by two members of the New World Agricultural Group describes the group's encouragement of progressive agricultural initiatives both in the midwestern United States, and in Nicaragua. In another article, two members of the Stonybrook SftP chapter describe their work in exposing and fighting Temik[4], a toxic pesticide which has made its way into the water table of Suffolk County, Long Island.

In 1971, the authors of the booklet, "Towards a Science for the People" wrote:

> The same government-corporate axis that funds applied research . . . also supports almost all of our basic, or to use the euphemism, "pure" research . . . Today, basic research is closely followed by those in a position to reap the benefits of its application—the government and the corporations.

David Noble takes up these same issues in his article, "Academia Incorporated." He describes the history and intricacies of corporate funding for academic research, a growing aspect of the power structure pervading the planning of academic scientific research.

The last two goals in the 1971 booklet, "ideological struggle" and "demystification of science and technology," are still important activities of SftP today. In this issue, we publish two articles about progressive approaches to science teaching. In addition, an opinion piece and a conference report discuss ongoing struggles. The peace movement is undoubtedly the most active and visible political struggle in the U.S. today. Lynn Stephen explores the relationship between the women's movement and the disarmament movement. Les Levidow of the British *Radical Science Journal* reports on a recent international conference of progressive science journals.

We think this issue points to important new directions for SftP. We want to continue to criticize claims that scientific studies are politically neutral. We want to expand our concrete, hard-hitting documentation of corporate, governmental, and academic abuses of science. But we also want to focus on creating strategies to move towards a science for the people in the *next* 15 years.

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*For a more complete history of Science for the People, see Kathy Greeley and Sue Tafler, "Science for the People—a Ten Year Retrospective," in *SftP* Vol. 11 No. 1, January/February 1979.

**Bill Zimmerman, Len Radinsky, Mel Rothenberg, and Bart Meyers, *Towards a Science for the People,* Brookline, MA: A People's Press. 1972. Copies still available from the SftP office.

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FEATURES:

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DEPARTMENTS:

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letters

SCIENCE AND LIBERATION

Dear SftP:

I read your book, *Science and Liberation,* with ambivalent feelings. Finally, I realized the cause of these mixed feelings when I read the article, "History of Science for the People: A Ten Year Perspective," I perceive a great discrepancy between word and deed.

Your organization and its publications provide valuable insights into the abuses of science. I find your magazine a great source of information and impetus for class discussions. For example, "how genetic screening might be used" and "the problems of recombinant DNA" were helpful during genetic studies. The students began to see the necessity for studying this complex subject. However, I also see narrowmindedness in your organization, something you accuse science in this country as being. Personally, I agree with you, but you will never be an agent of change, if you practice what you accuse others of being.

You are doing an excellent job of describing science abuses in this country, but, more dangerously you allow your readers to accept the fallacy that Marxist countries use science solely for the good of its people. There are several examples exemplifying this point. You exposed the CIA's role in Nicaragua, while neglecting KGB practices. The Soviets have employed science for the annihilation of a people, Afghanistan. You accuse American business of spreading technology to countries that violate human rights, while you have sent scientific articles to Vietnam without clarifying the role of the government in the massacre of the H Mong, Cambodians, or Laotians. Again, all countries have inhumanely employed science. Even China has spent millions on sophisticating its nuclear weaponry arsenal.

As a much needed organization you should enact several changes. One: you must truly be science for all the people. To achieve this, you must become international. Not only do all countries abuse science, but one country can cause problems for another; acid rain is a perfect example. Two: you must discuss all points of view rather than one political philosophy. By exposing only one theory you put people in this country and in other countries on the defensive where they are in no position to hear you or amend their abuses.

I vehemently feel that your task is to expose science's use for the destruction of mankind, profit making schemes that sacrifice an individual's quality of life, and the discrimination of a group of people. You must represent all the people regardless of political belief or nationality. Continue your criticisms of worldwide science abuses, but keep the political rhetoric for the editorial page.

Denise L. Black

BIOLOGICAL WARFARE

Dear SftP:

I just saw the letter concerning my recent article in Science for the People ("The Next Generation of Biological Weapons," *SftP,* vol. 14 no. 3), and would like to respond to your criticisms. As you observe, "With more hard information and less speculation, we can start to build public and scientific opposition to the growing military research on biological weapons."

Exactly. You criticize me for speculating about possible military applications instead of providing hard information about military research. As I mentioned in the article, there is no hard information to be had. Have you tried asking anyone in the Pentagon what specifically the military is doing with recombinant DNA and hybridoma technologies? You might want to give it a try.

My speculations are derived from my experience in the biotechnology industry (I consult to genetic engineering firms, and direct research and development for a San Francisco-based company). Commercial applications I am familiar with range from the obvious to the ludicrous, and some may take decades to reach the marketplace. Nonetheless, they are of sufficient potential value that many chemical, pharmaceutical, and energy companies are willing to risk their capital and time to explore them. The military takes a similar attitude.

I am pleased you find that my "scenarios for new biological warfare agents have only the flimsiest scientific basis," but I do fear that the Pentagon will not agree with you in every case! In any event, my purpose was not to design new weapons, but to underscore the need for public education of a growing threat to health and peace. I hope that technical sophistication will not have to be a prerequisite for criticism of the military program—scientific snobbism often acts as an excuse to keep the public in ignorance until critical decisions have already been made.

The crucial issue here is quite simple. Military genetic engineering research is a serious threat to public health. Even if all research is purely defensive, as spokesmen for the military claim, the work involves handling and manipulation of extremely dangerous organisms without proper regulation and review. And anyone who thinks the "Department of Defense" uses the same definition of "defensive" as the rest of us should think more carefully.

Alexander Hiam

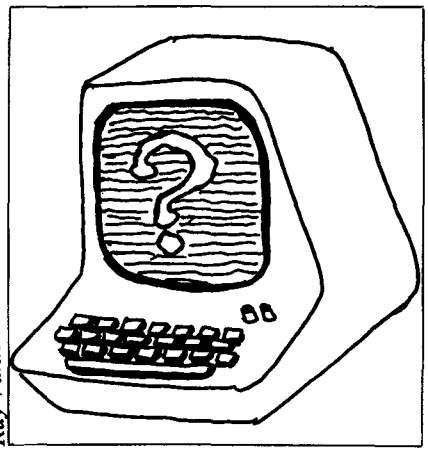
An Appeal to our Readers

This is it! Our celebration of fifteen years of Science for the People. This issue is our longest one ever, but more importantly through its remarkable collection of articles, it represents those years of analysis, education and activism. In this bleak time of increased military control of science and of federally-sponsored attacks on progressive ideas, it is more important than ever that we do our job well. To do that, we need your help. This issue represents a heavy investment of time, energy and money. Its longer length means that it will cost about $1000 more than usual to print. We have also just launched a long overdue $15,000 direct mail campaign which we hope will increase our subscriptions significantly. In addition, we have recently hired two new people for our staff positions which has meant extra salary expenses while the departing staff showed them the ropes. Although we are excited about the fresh ideas and renewed enthusiasm that new staff bring, we are also concerned about paying their salaries. We need your contributions to keep us afloat financially. Any amount will help. We are in this struggle for the long haul and we are all in it together. Get in touch with your local SftP contact to lend your skills to the struggle. Send us your tax-deductible contribution to help us keep going. Send your contributions to Science for the People, 897 Main St., Cambridge, MA 02139.

news notes

VDTs AND PROBLEM PREGNANCIES

A possible link between miscarriages and birth defects and the use of video display terminals (VDTs) has alarmed many women clerical workers. Since July 1980, eight separate reports of high levels of problems pregnancies among women VDT users have appeared. Although each of these reports has involved small numbers of workers, the data is nonetheless disturbing. In a Sears, Roebuck & Co. office in Dallas, over a 14 month period 7 out of 12 pregnancies were terminated by miscarriage and in an eighth case an infant died prematurely.



Ray Valdes

Out of 94 total pregnancies reported in the eight workplaces, 56 were terminated by miscarriage or infant death. Although studies by both the National Institute for Occupational Safety and Health (NIOSH) and the division of electronic products and radiological health of the Food and Drug Administration (FDA) have revealed no adverse radiation emitted by VDTs, the birth defects reports suggest a cautious approach until more is known. VDTs are known to emit low energy non-ionizing radiation and while this radiation is generally believed to be of little or no biological danger, it is true that developing embryos are uniquely sensitive to radiation and chemical damage. A Canadian government task force has recommended that pregnant women not be required to work with VDTs and the Ontario Public Service Employee Union has written such a clause into its contracts. Certainly it is time for U.S. unions to take similar actions.

DNA BILL VETOED

A bill to regulate recombinant DNA research was vetoed by Governor Edmund Brown of California after it was passed by the state legislature. Brown believed the bill was unduly restrictive and burdensome to biotechnology companies. The bill would have required state agencies to follow the NIH recombinant DNA guidelines and to give proof that the guidelines were being observed. Sponsors are now uncertain whether to try to override the veto or to work out a compromise bill.

—*Information from* Science, *Oct. 25, 1982, p. 273.*

MISSISSIPPI SELLS PESTICIDES

Environmental groups are up in arms since the EPA this fall granted emergency exemptions for the states of Mississippi, Arkansas, and Texas to use a pesticide called Ferriamicide. While it is becoming quite common for the EPA to give states waivers for hazardous pesticides, this is more unusual: in this case, the state of Mississippi is manufacturing the pesticide and profiting from its sale.

When a toxic pesticide called Mirex was phased out in the 1970s, Allied Chemical, the manufacturer of Mirex, left their factory, stocks, and the rights to the pesticide to the state of Mississippi. Mississippi continued to make Mirex while it was being phased out and has since come up with a variant of Mirex called Ferriamicide. Since 1979, Mississippi has been pushing hard for permits to use Ferriamicide even though it may be at least as toxic as Mirex.

Used against the fire ant, a pest common to the South, Mirex degrades into Kepone, which is a proven carcinogen in rats and mice, and neurotoxin in humans, and persistent in the food chain. Despite these drawbacks, it is clear why the state has a vested interest in the fire ant's extermination. Furthermore, Mississippi's state-subsidized pricing for Ferriamicide is keeping less toxic and more rapidly degradable products from competing in the market.

—*Information from* Science, *November 5, 1982.*

BLACKLISTING IN THE NUCLEAR INDUSTRY

An industry that spends enormous sums of money to convince the public that it is responsible and concerned about safety seems to be terrified of one honest man. Charles A. Atchison has been fired from three jobs in the nuclear industry. Even the Reagan Labor Department has concurred that all of these dismissals were in violation of the federal law designed to protect "whistle-blowers."

Atchison's troubles began when he was asked to testify before the Atomic Safety and Licensing Board about safety defects at the Comanche Peak nuclear power plant near Glen Rose, Texas. His testimony about pipe welding flaws resulted in his being fired from the Comanche plant. Later, when Atchison found himself being fired within hours after being hired at a nuclear power plant in Louisiana, he charged that the industry had blacklisted him. His dismissal from yet a third industry job forced the Labor Department to support his charge. Is it any wonder that the U.S. public is at last rejecting an industry that would rather endanger the lives of millions than face up to the truth?

DEMOCRATIZING SCIENCE

In France, Mitterand's socialist government is attempting to democratize science by increasing the involvement of science workers and the general public in science policy. Under new regulations of the Center National de la Recherche Scientific (the French counterpart of the National Science Foundation), laboratory assistants and technicians will be included in decision-making. To increase the accessibility of science to the general public, the government will establish "boutiques

des sciences" or science shops, through which members of the public can receive help with scientific and technical problems. The science shop concept is based on experiments carried out by universities in Holland. For an in-depth report on the Dutch science shops, see "The Amsterdam Science Shop: Doing Science for the People." *Science for the People,* Sept/Oct 1979, Vol 11, No. 5.

BORING JOBS AND HEART DISEASE

Researchers in Sweden and the U.S. have found that people with boring, "low decision latitude" jobs have a higher incidence of heart disease than people who have more control over their work. Jobs identified as high-risk usually involved work where machines dictate the pace (such as on an assembly line) or jobs where workers spend most of their time in contact with the public (such as waiting tables). The health risks of these jobs equalled that of smoking and high cholesterol consumption.

These findings rebuke the traditional theory that heart disease is induced by executive-type jobs where decision-making causes stress. Researchers involved with this study feel that businesses should be restructured so that workers have more control over their work.

—*Information from* New Scientist, *Oct. 28, 1982, p. 216.*

ATOMIC BOMB TESTING AND SHEEP

A federal judge in Salt Lake City recently accused the Atomic Energy Commission (AEC) of misrepresenting the facts about sheep deaths which followed atomic bomb testing in Nevada in 1953. The AEC avoided paying damages to the sheeps' owners in 1956 by convincing Judge Christensen that radiation damage could not have been a factor in the deaths. However, the same judge changed his mind this summer, after reviewing evidence that the AEC had suppressed critical data. Furthermore, the AEC was found to have exerted pressure on two veternarians who initially decided that the deaths

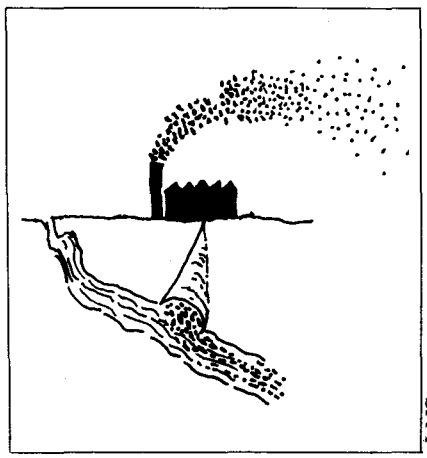
This graphic is from an AEC pamphlet issued in 1957. The pamphlet advised ranchers not to worry if their geiger counters went crazy.

were radiation-related. According to Judge Christensen, this pressure amounted to "deceitful conduct beyond acceptable discussion among scientific colleagues preparing to reflect their own views in court."

—*Information from* Science, *Vol. 218, Nov. 5, 1982.*

THE ENVIRONMENTAL POLLUTION AGENCY

The behavior of the Environmental Protection Agency has reached such extreme disregard for the environment that many now think it is only a matter of time until the Reagan Administration formally changes its name to the Environmental Pollution Agency. It has become difficult to keep track of all the destructive actions carried out



by the EPA. After refusing to regulate formaldehyde use, despite the fact that it had been clearly demonstrated to be a carcinogen, and after halting proceedings to ban the use of 2,4,5-T, even though it is known to contain dangerous levels of the contaminant dioxin, the EPA has once again managed to reinterpret one of its own reports. The EPA draft report on the causes and impacts of acid rain was prepared over a two-year period by more than 50 contributing scientists. A copy of the 1200 page document obtained under the Freedom of Information Act by *Science Trends Newsletter* was described as demonstrating that utilities and industries in the Midwest are major sources of sulfur dioxide. The acid rain generated by the industries results in the widespread destruction of lake and land ecosystems in the northeastern U.S. and southeastern Canada.

The EPA is so uncomfortable with this data that assistant EPA administrator Kathleen Bennett has insisted that the evidence is still incomplete and that it is premature to take any corrective action. It is of interest to note that Bennett was previously a lobbyist against environmental regulations for Crown Zellerbach Corporation, a paper manufacturer. Tensions between the U.S. and Canada have risen greatly over recent years due to the unwillingness of the U.S. government to deal seriously with acid rain. Once again Reagan's EPA shows its preference for profits over the environment.

UPCOMING ISSUE OF SFTP

The East Coast Editorial Collective is soliciting articles for the July/August 1983 special issue on, "Water Resources: Degradation and Recovery."

Please send articles, outlines, graphics and other material to: Science for the People, 897 Main St., Cambridge, MA 02139.

CORRECTION

In the Nov/Dec 1982, vol. 14 no. 6, *SftP* in the article, "The Wonder Drug We Should Wonder About" reference 24 should read: Much of the information in this section came from Seamans' book cited above, and Susan Bell, "The DES Controversy: Discovery, Distribution, and Regulation," in *The Custom Made Child? Women Centered Perspectives,* edited by Helen B. Holmes, Betty B. Hoskins, and Michael Gross, Clifton, NJ: Humana Press, 1981.

"Selling the Tree of Knowledge"

ACADEMIA INCORPORATED

by David Noble

American universities, public and private alike, are invaluable resources. Supported primarily at public expense, in the interest of society as a whole, they serve as vehicles for the transmission of society's store of knowledge and skills, dominant ideas and values. They function as an independent space within which to reflect critically on society. They are also the major agencies dedicated to the advancement of scientific knowledge in this country. Today, as never before, this vital public resource is being transformed into a private preserve. Private corporations are purchasing privileged access to universities in order to gain control over the research carried out there. Scientists and administrators within the universities are fully cooperating by selling the public birthright to the highest bidder.

Upon close inspection, it becomes clear that both the buying and selling are being done by a relatively small elite corps of academics and industrialists who rotate routinely among positions in the interrelated corporate, scientific, and university arenas. It is also clear that their actions are in violation of both the public trust and the public interest, diverting taxpayer resources for private purposes at public expense. This "selling of the tree of knowledge to Wall Street," as Congressperson Albert Gore, Jr. has termed it, has had the consequence of blurring the distinction between two quite different institutions: the university and the private industrial corporation.[1] As a result, we see the corruption of neutral competence and the restriction of the academic freedom of independent and critical thought. Most importantly, this transformation constitutes a serious threat to the traditional American values of democracy and equality. Placing public resources in a few private hands denies access to those less endowed or less powerful taxpayers who must continue to shoulder the major cost for universities—the same taxpayers who will inevitably bear the consequences of the privately-directed research done in their name.

There are many reasons why this transformation is taking place now.* The relative decline in government funding, a reflection of the recent conservative trend in American politics, has prompted university administrators to seek support from the private sector. Government demands for greater university accountability during the last decade has also driven university administrators into an alliance with private industry, and into a campaign against government regulations. In addition, new developments in high-technology areas such as telecommunications, computers, and microelectronics have established the importance of scientific "intellectual capital" in the latest round of intensifying international competition. This competition is based upon an obsession with innovation and technology transfer and has encouraged an "industrial connection" between science-based firms and research universities.

But the transformation of our universities can not be blamed solely on recent high-technology developments. It is the natural consequence of postwar patterns of university-government relations, especially with respect to scientific research. Established nearly four decades ago, these patterns lend themselves perfectly to the commercial abuse of the nation's scientific resources.

David Noble teaches in the Science, Technology, and Society Program at the Massachusetts Institute of Technology. He has been writing extensively on the relationship between academic research and military/corporate funding. He is the author of America By Design.

*For a fuller account of recent developments, see David F. Noble and Nancy E. Pfund, "Business Goes Back to College," *The Nation*, September 21, 1980; David F. Noble, "The Selling of the University," *The Nation*, February 6, 1982; and David Dickson and David F. Noble, "By Force of Reason: The Politics of Science Policy," in *The Hidden Election*, edited by Thomas Ferguson and Joel Rogers. (New York: Patheon), 1982.

The current policies give unique license to private citizens—academic scientists in universities—to allocate and use public funds as they see fit, so long as it contributes to the interests of science as defined by scientists. This is a license to commercially exploit public resources for private gain. It is imperative to forestall the type of elite control of science which is now taking place on the nation's campuses. To do this effectively, we must examine the history of the postwar patterns of research funding that we have come to accept as natural and routine.

The Origins of Postwar Funding Patterns

During World War II, the federal government became the major supporter of academic scientific research. Prompted by wartime expediency, the civilian-run Office of Scientific Research and Development (OSRD) established the now-familiar pattern of government research contracting. In this relationship, private firms and universities began to perform the bulk of research and development work for the government. In return, the government financed their expanded operations. By the war's end, there was widespread agreement among scientists and government officials alike that such federal support of university-based scientific research should continue. The academic scientific community was especially enthusiastic about the prospect of sustained public support for their work. As historian Michael Sherry has observed, the scientists "led the drive to institutionalize the war-born partnership with the military...[they] did not drift aimlessly into military research, nor were they duped into it. They espoused its virtues, lobbied hard for it, and rarely questioned it."[2]

During the war, the direction of research had been determined by military criteria. After the war, scientists had to face the problem of defining whose objectives and what criteria would set peacetime research priorities.

As early as 1941, Massachusetts Institute of Technology (MIT) President and OSRD leader Karl Compton noted that wartime research would "presage a new prosperity for science and engineering after the war." Edward L. Bowles, MIT electrical engineer and science advisor to Secretary of War Henry Stimson, urged that a "continuing working partnership" be established after the war between scientists, educational institutions, and the military. This postwar integration, said Bowles, "must transcend being merely doctrine; it must become a state of mind, so firmly embedded in our souls as to become an invincible philosophy." As Sherry comments, "Compton and other proponents of pure science saw the chance to turn a temporary windfall into permanent federal support...The more sophisticated propagandists of scientific preparedness...viewed weapons research as part of an integrated program of peacetime mobilization."

During the war, the direction of research had been determined by military criteria. After the war, scientists had to face the problem of defining whose objectives and what criteria would set peacetime research priorities. How might scientific and technological efforts be encouraged under private auspices, at public expense, while still safeguarding the larger public interest and the standard of equity? How might the government guarantee the autonomy and integrity of science, yet uphold the principle of democratic control over and accountability for public expenditures? These challenging questions were never resolved during the early debates over postwar science policy; nor did scientists ever confront them seriously. The scientists' characteristically contradictory positions served merely to allow them to have their cake and eat it too.

"Trickle-Down" Science

Essentially, with regard to the public interest, scientists adhered to a "trickle-down" theory akin to the classical economics espoused by their friends in industry. They conveniently believed that if scientists remain free to pursue their calling as they see fit and to satisfy their curiosity about nature, their efforts will inevitably contribute to the general good. They believed that what is good for scientists is good for science, and what is good for science is good for society and they argued this position as a mere article of faith.

Their faith in science was almost religious. At the core of their belief lay the myth of an autonomous science, destined by Fate to be always in the public interest. It followed from this view that any undue government intervention in science, in the name of democracy, would have the same unwanted effect as would, say, undue government interference in the supposedly self-regulating market: it would upset the delicate mechanisms of progress and do irreparable damage to society. In short, scientists claimed unique privileges for themselves, their community, and their institutions—to be publicly supported in their activities but to be otherwise immune from public involvement.

Predictably, then, when the scientific statesmen sought to perpetuate the pattern of military contracting established by the OSRD during the war, they attempted to do so without legislation and without having to go through Congress.

The Academy Plan

The idea for a research board funded by the military but administered by civilian scientists was first advocated by Frank Jewett, former head of Bell Laboratories, Vice President of American Telephone & Telegraph (AT&T), and president of the National Academy of Sciences. He suggested that the board be administered through the private National Academy and promoted by a War Department Committee on Postwar Research, which was headed by General Electric president Charles E. Wilson. The "Academy Plan," as it became known, reflected the scientists' double desire for funds and autonomy, as well as their deep distrust of the legislative processes of democracy. As historian Daniel Kevles has noted, the members of the War Department Committee on Postwar Research "believed that scientists, at least academic scientists, did not require subjection to normal democratic controls," a belief that reflected their "politically conservative propensities" and especially "their tendency to be comfortable with the entrustment of public responsibility to private hands."

The plan outlined by Jewett met with a certain amount of criticism in the Senate. However, since the National Academy of Sciences had already been chartered by Congress, the Academy Plan could be implemented by Executive order alone, bypassing the Senate. This would enable the scientists to avoid having to deal with the Senate's opposition, an evasion which the promoters of the Academy Plan considered to be its chief advantage. In late 1944, a "Research Board for National Security" was established along the lines of the Academy Plan with the expectation that it would eventually be funded through military appropriations. At a gala inauguration dinner in March 1945, the elite of the scientific and military worlds, anticipating executive approval, congratulated one another on their devotion to peacetime progress through military strength. Their celebration, however, was short-lived.

Barely a month later, President Roosevelt killed the Board by forbidding any transfer of funds to it from military appropriations. The sponsor of this executive action was Budget Bureau Director Harold Smith. Smith had become concerned about the scientists' attempt to circumvent the legislature and insulate themselves from government supervision. He viewed the entire plan as fundamentally undemocratic. Specifically, he rejected "the assumption that researchers are as temperamental as a bunch of musicians, and that consequently we must violate most of the tenets of democracy and good organization to adjust for their lack of emotional balance . . . The real difficulty," Smith opined, was that the scientists "do not know even the first thing about the basic philosophy of democracy." The *New Republic* agreed. Referring to the "fantastic suggestion that in the long run the National Academy of Sciences should usurp the functions of the Executive," the journal argued that "the American people should no more acquiesce in the present scheme than to a proposal that the carpenter's union [alone] should elect members of a board which is to plan public works."

Estelle Carol/Bob Simpson

The demise of the Research Board for National Security meant that the National Academy of Sciences would not serve as the conduit for military funding of civilian research. This did not put an end, however, to the scientists' dream of military support for their activities. Congress soon authorized military agencies to award research contracts directly to the universitites, providing a more significant and enduring vehicle for defense-funded research.

Military Control of Research

The Navy was the first to assume responsibility for support of academic research. Admiral Furer, Navy coordinator for research and development, had formulated elaborate plans for Navy support of science. This prepared the Navy to take advantage of the congressional authorization of funds. Shortly thereafter the Office of Naval Research (ONR) was established to contract with universities for military-related research. Within a few years the ONR had established itself as, in Kevles' words, "the greatest peacetime cooperative undertaking in history between the academic world and the government."

By 1949, the ONR was sponsoring 1200 research projects at 200 universities, involving 3000 scientists and nearly as many graduate students. Equally important, the ONR contract system was patterned after that established by the OSRD, which guaranteed scientists a considerable degree of autonomy. Daniel Greenberg observed that the Navy subsidized science "on terms that conceded all to the scientists' traditional insistence upon freedom and independence—thereby institutionalizing in peacetime the concept of science run by scientists at public expense." In 1949 the Air Force joined the Navy as a major supporter of university-based research, along similar lines. By 1948, the Department of Defense research activities accounted for 62% of all federal research and development expenditures, including 60% of federal grants to universities for research outside of agriculture. By 1960, that figure had risen to 80%. Thus, the scientific elite were successful in their effort to secure military support for postwar science, in the name of national security.

Funding Civilian Research

The scientific elite also sought to create a permanent federal agency which would foster a broader range of civilian research activities, in the name of economic innovation. A leader in this effort was Vannevar Bush, who headed the OSRD during the war and who was a former Dean of Engineering at MIT, a major military research center. Bush was a cofounder of Raytheon Co., a major defense contractor, and he pioneered development of analog computers for ballistics calculations. He was also a director of such profit-oriented science-based firms as AT&T and Merck & Co. He was thus no stranger to—nor critic of—military preemption of science. Yet, when it came to democratic scrutiny or control of science by Congress, Bush posed as a champion of so-called pure science. "The researcher," he insisted, is "exploring the unknown," and therefore "cannot be subject to strict controls."

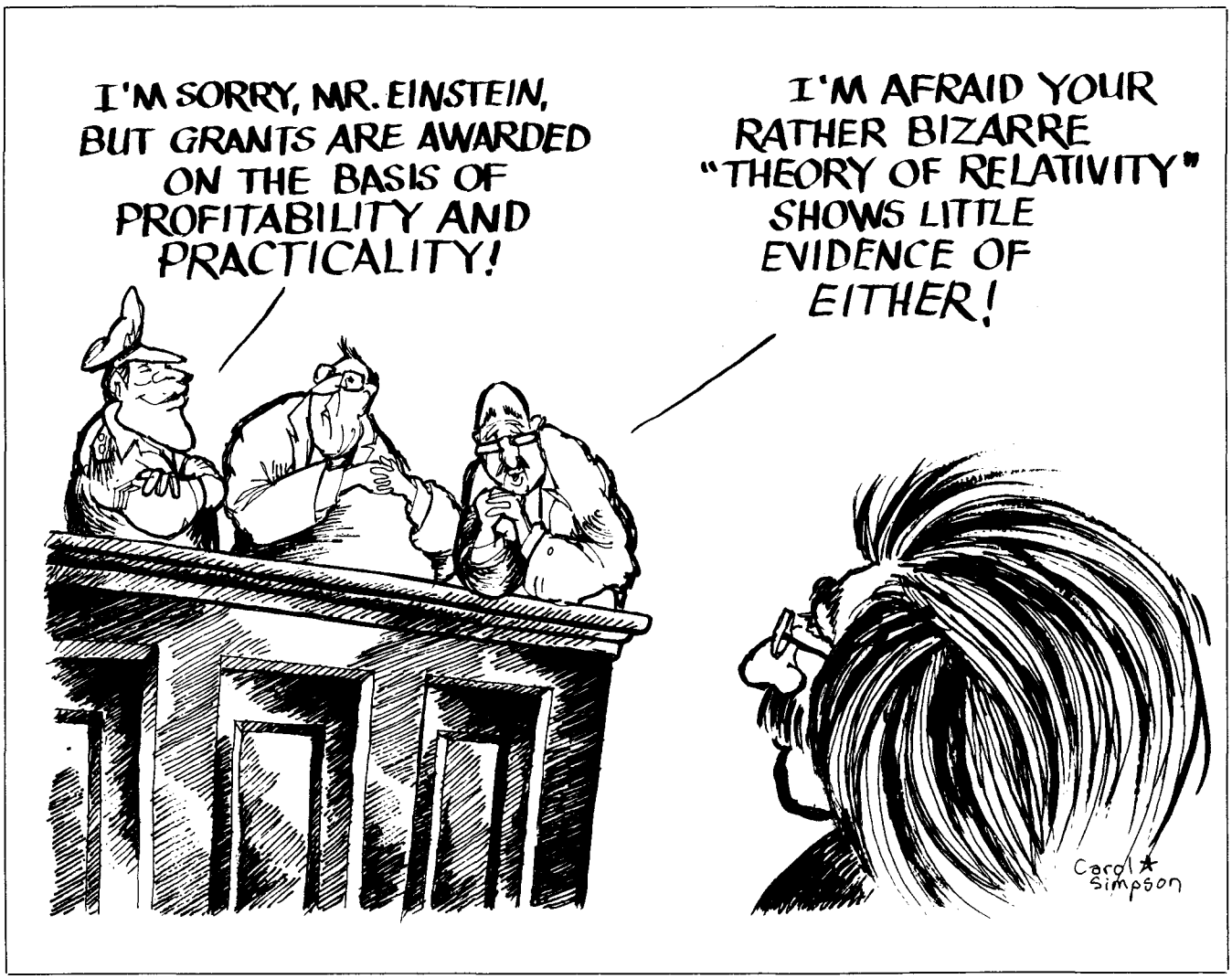
The effort of Senator Harley Kilgore of West Virginia to democratize science prompted Bush to formulate specific plans based on scientists' interests. In short, what Vannevar Bush and his colleagues were responding to was a threat that the Academy Plan promoters had hoped they could circumvent—the threat of greater democratic control over postwar science.

The Push For Democratic Control

Senator Kilgore, chairman of the Senate Subcommittee on War Mobilization, advocated tight federal controls over government science spending and public ownership of patents resulting from publically-supported research. He also favored a policy stating that scientists must share control over science with other interested parties. Scientists, argued Kilgore, must be responsive to normal democratic controls like everyone else. Scientific research should be directed less by the mere curiosity of scientists than by an awareness of pressing social needs.

During World War II, large firms and the major private universities received the lion's share of defense contracts, at the expense of smaller firms and less-favored universities. Of all wartime research and development contracts, two-thirds went to 68 firms, *of which 40% went to only 10 firms.* Of the $250 million in contracts given to 200 universities, two-thirds went to 19 favored schools; the largest portion, $56 million (or roughly one-fifth of the *total* budget) went to MIT. Early in the war, Kilgore had formulated a bill for a new Office of Science and Technology Mobilization. His immediate concern was to utilize more fully the nation's scientific resources for the war effort, through a more equitable distribution of federal support than that being provided by the OSRD. Kilgore was very much concerned that public resources like science be protected from private control by the "monopolies."

In addition to the issue of distributing funds more equitably, Kilgore was concerned with patent ownership. At the discretion of OSRD leadership, over 90% of the research contracts awarded during the war granted ownership to private contractors of patents on inventions resulting from publicly-supported research. Kilgore considered this policy to be an unwarranted giveaway of public resources. He did not consider corporate control of the fruits of research to be in the best interest of the American people. Although patents were granted to companies as an incentive, to encourage them to develop their ideas and bring new products and processes into use, Kilgore knew that such a policy sometimes had the opposite effect. Patent ownership could also lead to the restriction of innovation, in the interest of corporate gain.



Estelle Carol/Bob Simpson

Above all, Kilgore was determined to have the government insure that science be advanced according to the time-honored principles of equity and democracy. Assistant Attorney General Thurman Arnold joined Kilgore in his efforts, declaring that "only government could break the corner on research and experimentation enjoyed by private groups."

Thus, Kilgore sought to alter the patterns of research established during the war by the OSRD. His proposed Office of Science and Technology Mobilization, which evolved into a plan for a postwar National Science Foundation, emphasized lay control over science as well as a fair measure of political accountability. It was to be headed by a presidentially-appointed director to guarantee greater accountability. The director would be advised by a board composed of cabinet heads and private citizens, insuring the representation of consumers, small business, and labor, as well as of the scientific establishment and big business. Moreover, the proposed agency would strive to grant contracts on an equitable basis to firms and universities, and would retain ownership of all patents as a safeguard of the public interest. Kilgore insisted that the agency be viewed as a means of meeting social ends, not merely as a vehicle for "building up theoretical science, just to build it up."

The Establishment Fights Back

Vannevar Bush was alarmed by Kilgore's proposal for a scientific organization explicitly responsive to the interests of nonscientists. He was joined in his opposition by his colleagues in the Army, the Navy, the National Association of Manufacturers, and the National Academy of Sciences. Frank Jewett viewed the Kilgore plan as a scheme for making scientists into "intellectual slaves of the state." Harvard president and fellow OSRD leader James Conant warned of the dan-

(Continued on page 50)

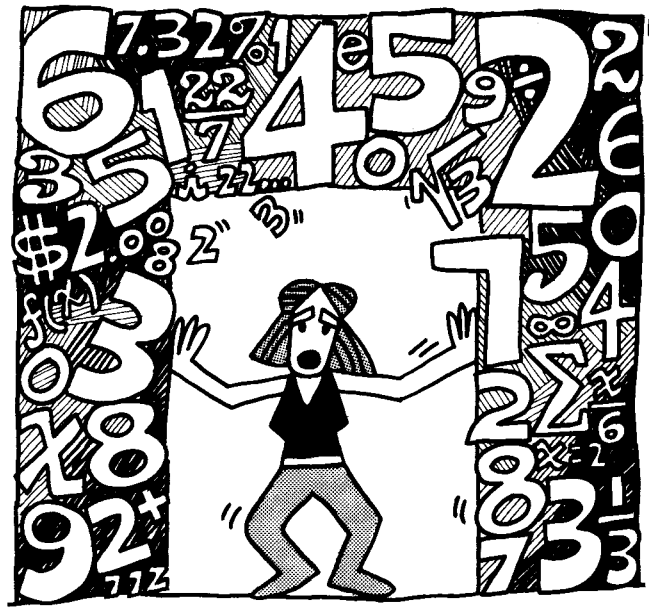
Taking the Numb Out of Numbers

TEACHING RADICAL MATH

by Marilyn Frankenstein

In 1980, at a workshop I gave on "Political Math" at the National Council of Teachers of Mathematics conference, most of the audience objected strenuously to my claim that all math education is biased. I argued that even a trivial math application like totaling a grocery bill carries the non-neutral message that paying for food is natural, and that society should be organized in such a way that people must buy food from grocery stores. I argued further that traditional math courses which use no real-life data carry the non-neutral hidden message that learning math must be divorced from helping real people understand and control the real world. I wondered if those same teachers objecting to my discussion of "Political Math" also objected to the 1981 conference workshop which examined "the activities and applications of applied mathematics in the mapping processes at the Defense Mapping Agency" or the workshop on "Mathematics and the Military" which discussed "the importance of mathematics to the nation's readiness."[1]

Although I am sure most of the teachers who attended my workshop would disagree, I believe that traditional mathematics education is often used against people on both personal and political levels. Many people (especially women) are made to feel inferior and incompetent because they "cannot do math." Many people cannot make intelligent consumer decisions, such as choosing which loan to obtain, as well as they could if they were confident in their understanding of mathematics. Politically, people can be more easily oppressed when they cannot break through the numerical lies and obfuscations thrown at them on a daily basis. A mathematically illiterate populace can be led to believe, for example, that welfare programs are responsible for their declining standard of living. Lack of math knowledge will inhibit them from researching the numbers to find out that "welfare" to the rich dwarfs any meager subsidies given to the poor. (Here are a few examples: in 1975 the maximum payment to an Aid for Dependent Children (AFDC) family of four was $5000 and the average tax loophole for each of the richest 160,000 taxpayers was $45,000;[2] in 1980 $510 million of our tax money paid for new airports so that private pilots would not land their planes at large commercial airports;[3] and, our taxes also pay for "defense company lobbying since lobbying costs can be included in a contract....five [defense] companies charged the Defense Department $15.8 million of the $16.8 million they spent to maintain Washington offices between 1974 and 1976.[4]) A mathematically sophisticated populace has an important tool with which to fight back. When the Coalition for Basic Human Needs, for example, prepares statistics to show that actual shelter costs in every major Massachusetts city exceed the AFDC welfare grant,[5] they have a powerful argument to use to prevent cut-backs and to heighten people's awareness of the living conditions of welfare mothers.



Steve Karian

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Basic Mathematics *for* the people means more than the ability to calculate. It means the ability to reason quantitatively, the ability to use numbers to clarify issues and to support or refute opinions. Mathematics education *for* the people must also be mathematics education *with* the people. It cannot be taught using what Paulo Freire calls "banking" methods: "expert" teachers depositing knowledge in the presumably blank minds of their students who memorize the required rules in order to get future dividends.[6] It must be taught by students learning math together; by students creating as well as solving problems, so they can control how math is used, and control their own learning process.

This article describes a non-neutral basic math course that I developed to be a "mathematics for and with the people."[7] The content teaches arithmetic while simultaneously raising political consciousness. The methods try to break down traditional authoritarian teacher-student relationships by giving students meaningful control over their own learning. The aim of the course is to educate people to understand the need for radical social change, while giving them both the math literacy tools necessary to challenge ruling class ideas, and the cooperative learning experiences necessary to create and live in a new society.

The Critical Curriculum

Although most of my twelve years of teaching have been in alternative schools, it is only over the last few years that my politics and my teaching have become truly integrated.

When I taught at Park East, an alternative high school in East Harlem, my students knew my political beliefs only because of the posters in our classroom and the announcements I made at town meetings. My math courses had nontraditional content, such as math magic and math-art, but no radical political content. I was actually quite angry with leftist colleagues who spent their class time talking revolution to kids who needed to improve reading, writing, and math skills. As a consequence of this anger, I refused to read education theory; I felt that intellectuals read and talked too much, and did too little.

When I began teaching at Stockton State Colege in New Jersey, originally an experimental "1960s-style" institution, my students enjoyed the magic and art. But they consistently asked "Why do we need to learn this?" I wanted to be able to answer with more than, "It teaches you to think abstractly." And, because I did not want to build a course solely around survival in a capitalist society, I tried to find nonconsumer, daily-life uses of math. I then realized what seems so obvious now—that many newspaper articles contained numbers, and that in order to analyze them carefully people needed a critical understanding of basic math. I started to design a curriculum using *The New York Times* as a text.

When I began my current job at the College of Public and Community Service (CPCS) at the University of Massachusetts/Boston's Downtown Campus, I had an ideal situation in which to expand the idea of using math to understand current events into using math to analyze critically the condition of society. The average age of our urban adult students is 36, and most are currently employed or preparing to work in public or community service. Most of the students, therefore, want to examine political issues and are interested in finding out how math can be used to understand more about those issues.

At CPCS I also had an ideal situation in which to begin reading radical education theory. Socialist colleagues who were both intellectuals and activists encouraged me to read Paulo Freire's work. His ideas convinced me that theory and practice *could* be valuably intertwined, so that reflection by reading and talking with students and coworkers improved my daily work, and modified and clarified my reflections. Freire also made me aware of the political implications of my teaching methods. During most of my years of teaching, I had thought my methods were those of any dedicated teacher who respected his/her students. Because I did not emphasize the radical philosophy behind my methods, they didn't have as strong a political impact as they could have. Now, I stress to students that it is not because I am "nice" that I treat them and their work with respect; it is not because I am "modest" that I do not view myself as superior to them or as an expert who understands things they never will; it is not because I am "idealistic" that I am confident they know more math than they think and will be able to understand math they felt they never could; it is not because I am "lazy" that I do not simply lecture, but encourage them to listen carefully and learn from each other. I act the way I do because in a socialist society the relationships between teachers and students will be restructured. Although we are presently living and struggling under capitalism, we can begin to explore and develop new social relations as part of creating socialism.

Math and Political Consciousness

The following sample problems illustrate how to integrate the teaching of basic mathematics with the raising of political consciousness, and how to foster critical thinking by expanding traditional problem-solving techniques to include definition of problems and gathering of required information.[8] All the problems have a purpose; performing the math operations clarifies the

data or presents it in a more forceful way. Also, teaching basic math by using it to analyze complex issues increases students' intellectual self-image. Since the applications come from a wide variety of areas, students will probably raise subject-matter questions the teacher cannot answer. They will realize that the teacher is not an "expert" with all the answers and they will gain self-confidence and experience in searching for information to answer their own questions, or in becoming what Freire calls "critical co-investigators in dialogue with the teacher."[9] Finally, the content of this radical math course challenges the fragmented view of society presented by a curriculum which breaks knowledge into separate, unrelated issues, to be discussed only by specialists. When math is taught as a necessary part of a careful analysis of the conditions of society, students develop a clear sense of how knowledge of specific subjects can be integrated to give a critical understanding of the world.[10]

Example 1 (used after basic operations with whole numbers have been studied):

A. The Empty Pork Barrel: Unemployment and the Pentagon Budget *by Marion Anderson uses numerical arguments and charts to document the fact that as the military budget goes up, the number of jobs lost in civilian goods and services (because of tax monies going to the military) exceeds the number of jobs generated by military contracts. Military spending at a rate of $78 billion a year is responsible for the annual loss of 907,000 jobs. Every additional $1 billion of Pentagon spending causes [an average] loss of 11,600 job opportunities..." How many jobs will Americans lose this year from our current level of military spending?*

   Solving this problem involves using many of the whole number operations and finding information. It can also lead to a discussion of the politcal bias of statistics. Exact military expenditures are difficult to determine because "by custom and accounting practice, national military budgets usually do not include expenditures for veterans' benefits, interest on war debts, civil defense, and outlays for strategic industrial stockpiling. Military budgets may also exclude all or part of national intelligence expenditures...there are also substantial social costs which are extra-budgetary, including...[such things as] tax exemptions accorded military priorities..."[11]

B. *Write a brief statement of your opinion about military spending. List the kinds of numerical data that would support your opinion. Find at least one of the facts that you feel would support your opinion and describe how you would find the others.*

The goal of this exercise is to make students aware of how people find and use numbers to support their arguments. For example, to argue against military expenditures, in addition to the number of additional jobs created if the military budget were spent on the civilian sector of our economy, one could find numerical information on the enormous amount of overkill both major military powers have; on the holocaust effects of nuclear war; on military-related expenditures, such as our support for the Phillipine and South African dictatorships; and, other uses of resources, such as "in an oil-short world, the newest military tanks will consume 1.9 gallons of gas per mile" and 20 times as much U.S. public research money goes for transportation into space as for mass transit on earth."[12] It is also important to stress that a detailed argument against military expenditures involves more than just numbers; it involves a discussion of the necessity of imperialism in advanced capitalist development and corresponding necessity of maintaining a huge military force to protect capital.

Thinking of the kinds of numerical data that could support an argument comes from experience with the types of questions that can be asked. For example, once the idea of comparing the results of military versus civilian spending on jobs is introduced, you think of asking that same question of other government spending. One instance is described in an article called "The Nuclear Numners Game"[13]: "A Senate Commerce subcommittee staff proposal sent to President Carter shows that a $1.65 billion investment in conservation, using public service workers, would create 100,470 new jobs and save over 2000 million gallons of oil per year...a $3.4 billion investment in a nuclear power plant...would create, at most, 11,000 jobs and save the equivalent of only 28 million gallons of oil."

Finally, as a source of information, you can introduce the students to various local action groups working on peace conversion, groups trying to link social service cuts with military budget increases, and groups connecting solidarity with Third World Liberation struggles to fighting the U.S. military build-up.

Example 2 (used to review percent): *According to "Eating Better for Less" by Lucille Sandwith,[14] 50 out of the 32,000 U.S. food manufacturing firms make 75%*

TEACHING COLLECTIVE ACTION

by Paul Rowland

During the past two decades, Paulo Freire developed a radical pedagogy for adult literacy programs in Third World countries. His work is based on the assumption that education should empower the learner to analyze the world and then act on this analysis. As a radical teacher of high school science, I have attempted to adapt Freire's method to the science classroom. Although my teaching methods are still evolving, I hope that the following description of activities will be useful to other teachers and learners who want to use our schools more effectively.

An important first step in radical education is to create a classroom atmosphere in which students are aware of the fallibility of the teacher and value their own opinions. To become what Freire calls the "teacher-student," the teacher must encourage students to critically examine both of these roles. The rule making, authority figure must give way to a partnership; in other words, the teacher must give up control of the student. Many teachers argue that giving up control is impossible, illegal, immoral or just suicide. My experience is that the anticipation is worse than the act. Real institutional constraints need to be recognized by both teacher and student but they should be clear from the start and not imposed later on.

A next step is to choose a social issue in the discipline and use it as a first attempt at problem-posing. Problem-posing involves facilitated discussion in which students develop an analysis of a socially relevant issue. The challenge for problem-posing teachers is to provide students with alternative ideas that allow the students to take actions (preferably collectively) which leave them feeling powerful and not defeated.

My first problem-posing discussion involved a tenth grade biology class in rural New York. After showing a filmstrip about life support systems, I posed the problems of who should have access to machines that save lives, who has access under our present system, who benefits from the use of extraordinary means for life support, and how these systems influence health care in general. My seemingly sullen biology class came alive and asked more questions than we answered. Over the years I developed similar sessions for my biology classes.

In 1976 I began teaching an environmental elective for high school seniors (still in rural northern N.Y.). This course went beyond dialogue and into action. We examined waste (electrical, food, paper) in the schools and presented recommendations to the school principal. We sampled a local stream above and below a village with no sewers (and suprisingly found no difference). Our visit to a nuclear power plant ended in a session with the public relations officer. Without any prodding or prior discussion, the students quizzed and discredited the company flack. Our busride home was dominated by a discussion of how outrageous it was for the consumers to have to pay to have people lie to them about the hazards of nuclear power.

The following year the class looked at land use and made recommendations to local planners on how they could control development in ways that would benefit the people of the community and preserve the uniquness of the area.

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of the net profits. Of these top 50 corporations, 31 bought 63% of the national media advertising, or roughly $5 billion in 1977. Of the top 25 advertisers from all industries, 18 were food companies.

A. *What percent of the U.S. food manufacturing firms make 75% of the net profits?*

This question requires careful reading since the many given percents might be confused with the percent asked for. And its solution serves a purpose: changing 50/32,000 to 0.2% highlights the fact that only a tiny percent of the firms make most of the profits. The information in the question can lead to a political discussion of agribusiness and corporate monopoly in general, as well as to a math-related discussion of the advertising industry. (For example, 70% of television food advertising promotes low-nutrient, high-calorie foods, whereas only 0.7% promotes fresh fruits and vegetables.)

Analyzing Error Patterns: All wrong answers involve some correct, logical reasoning. For example, there is logical thinking behind these subtractions:

48.37	23.45	128.423
− 5. 4	− 2. 8	−82. 22
43.33	21.37	46.401

This person subtracted correctly in relationship to basic subtraction facts and "borrowing." However, he or she did not understand the decimal place-values and therefore treated the decimal parts like whole numbers. The class not only analyzes this student's reasoning, but also discusses how to convince him or her that the method was wrong and how to teach him or her correct methods. Analyzing error patterns provides nonrote reinforcement of computation skills, and shows students that you respect their intelligence and will not think they are stupid when they make errors. This, in turn, encourages students to respect their own and each other's intelligence.

Keeping a Math Journal: Journals serve as vents for students' feelings about math and act as concrete records of progress for students who too often belittle their own successes and focus on what they cannot do. The jour-

nals help students realize that they can now accomplish what one month ago they thought was impossible and helps them clarify which learning techniques worked best and where they use math in real life. I collect the journals frequently and comment on them, offering encouragement, alternative solutions or perspectives, and explanations of how students' remarks on learning math often apply to learning in general. Students' comments on the class are very helpful in my lesson planning. I find time to read and comment on journals because I do not collect homework assignments, but instead give students the answers to homework problems and encourage them to work together and evaluate their own learning.

Students Teaching: In order to teach a math problem to someone, you must be able to recognize all the correct methods of solving it as well as the logic behind incorrect methods. As various students practice teaching, they begin to involve other students, asking them to justify their answers. The class checks itself and rarely lets a mistake go by. The students get very involved, arguing constructively and thinking creatively about solutions to the problems. The student teachers effectively involve even the quiet students, who are more willing to participate when asked by a classmate. A feeling of solidarity develops in the class as students, learning from each other, come to respect one another. After many students have had a chance to teach problems at the board, the class attitude begins to reflect their greater understanding of the role of the teacher. Students realize how difficult it is to think on one's feet, to write at the board, and to talk to people who are not paying attention. Having students teach helps break down the authoritarian image of the teacher and simultaneously builds true respect for the hard job good teachers do.

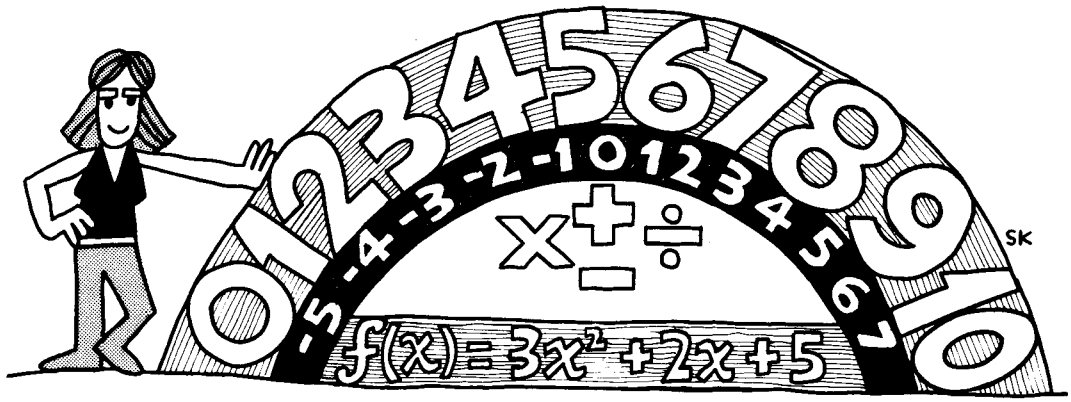
Students Working in Groups: In order for students to work in math study groups, the misconceptions they might have about math learning need to be dispelled, and they must realize how much they can learn from sharing their knowledge. They must have some understanding of why some people are quiet and others talk too much in groups, and through this understading they need to work together to make their group learning experience help everyone.[16] Some examples of suggested group tasks are:

B. *Based on the information given, create and solve a math problem whose solution involves using percents.*

Students will fully understand percents when they understand which percent problems can be created from given information. For example, here students must realize that you cannot find out how much profit the top 50 firms make, but you *can* find out how much money is spent on national media advertising. Also, it is unclear whether the national media advertising figure refers to the total spent by food manufacturing firms or by all industries. More information must be found in order to clarify this.

C. *Read the entire article. Discuss how at least three points in the article are supported by use of percents.*

The sample problems also illustrate the basic idea behind politicizing the content of any course: find political applications for each concept in the curriculum, teach those concepts in the context of the applications, create nonrote assignments which gradually involve the students in asking and answering their own questions, and, wherever possible, include information about local groups fighting to change the situation. In biology, for example, students can study the facts of reproduction through examining issues ranging from sterilization abuse to statistics on infant and maternal mortality rates among various races and classes. In chemistry, the process of molecular interaction can be studied through the specific science behind how corporations are polluting our environment for profits. An introduction to general science can include data on the numbers of blacks, hispanics, and women employed in different fields and anecdotal reports about the conditions of working in science.



Steve Karian

Alternative Math

As Freire says, "a project's methods cannot be dichotomized from its content and objectives;"[15] new teaching methods, as well as course content, are important in teaching mathematics for the people. The methods that follow are intended to counter the misconceptions about learning mathematics that are often part of traditional schooling. Students begin to realize that they are not "stupid" if they make a mistake, that people learn from analyzing their mistakes, asking questions, and evaluating exactly what they know and what they need to find out. Students start to understand that everyone learns at different rates, that learning is not linear, that going on to a new topic allows them to then review the old topic with deeper understanding, that stopping work on a problem to rest and later returning gives fresh insight, and that using math involves slow, careful thinking, not quick, immediate answers. Students discover that there are often many equally good ways to solve a math problem, that it is within their control to present numerical data effectively to prove their points, and that, depending on their assumptions and the real-life situation, there can be more than one correct answer to a specific math problem. Also, the following methods are intended to encourage students to share what they know with others and to work together to accomplish the task at hand.

- Group Evaluation of Homework—Working in groups of three or four, determine which homework problem was easiest and which was hardest. Evaluating homework questions is a good lead into having students create their own math problems. Also, this task shows students that because people learn in different ways, they find different problems easy or hard.
- Group Creation of Quizzes—Working in groups of three or four, create two review questions based on the previous lesson. Hopefully, the more practice students have in creating questions, the more they will become accustomed to asking questions, both in school and in their daily lives.

Currently, I am trying to create a better balance among problems which help students focus and document their criticisms of life under capitalism, and problems which show the victories that have been won against oppressors and in the fights that are now taking place. Only over the last few years, after reading Paulo Freire, have I overcome my own pessismistic feelings about our ability to change society radically. In addition, conversations in a class on "Politics and the Education of Oppressed Communities" have underlined for me the fact that one of the main obstacles to creating a socialist world is a popular feeling of powerlessness to change the existing social conditions. We radical educators must further the development of a "knowledge for the people" that will challenge basic assumptions, critically analyze society, and instill hope and the energy to act in our students. □

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8. The examples are some of the hardest problems in the course. I chose them to illustrate the goals of the course that are gradually built-up to during the term; and, to show the different types of critical, creative thinking used throughout the term. Compacting all these aspects into two examples meets length requirements for the article, but distorts the more gradual learning of problem-solving and problem-posing.
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The Temik Epidemic

FIGHTING PESTICIDES ON LONG ISLAND

by Ted Goldfarb and Dan Wartenberg

Imagine yourself in charge of a county health department where the most toxic agricultural pesticide licensed for use in the United States has just been discovered in drinking water wells. Imagine further that your county is 100% dependent on the underground water system for domestic water.

As you may have guessed, this is not just a whimsical hypothesis. In New York State, the Suffolk County Department of Health Services was faced with the situation described above. The pesticide Temik® (the active ingredient is aldicarb) marketed by the Union Carbide Corporation was discovered in eastern Long Island's aquifer, or underground water system. What follows is a brief account of the contamination event, a description of the initial, but inadequate, government response to the problem, and the political measures used to persuade health officials to be more responsive to the public's welfare.

The Contamination

The eastern end of Long Island's Suffolk County is an expensive resort area for New York City's population as well as the economically most important agricultural county in New York State.[1] Although many crops can be successfully grown here, most of the farmland is devoted to potato production. Potatoes do extremely well in Long Island's sandy, acid soil and temperate climate. Unfortunately, these conditions are also ideal for the proliferation of the Colorado potato beetle, and major pest infestations are common. Sales agents for chemical insecticide manufacturers have vigorously promoted their products as the cure-all for the farmer. The pest management staff of the local New York State Agricultural Extension Office have also advised the farmers that conscientious use of the chemical toxins will help solve their woes. Farmers responded by bombarding the insects with one toxic substance after another. For each new chemical, beetle damage was reduced for the first couple of years of use. Soon, the beetles developed resistance to this particular poison, the pest population rebounded to an even higher level than preuse times and crop yields suffered dramatically. Then it was time for the introduction of yet another pesticide.

Prior to the mid 1970s, the pesticides used were environmentally hazardous but they were not very water soluble. Thus no detectable amount of poison was carried into the aquifer. In 1975, Temik® , a highly toxic and water soluble pesticide was introduced. It had received the necessary approvals of the United States Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (DEC) and was applied to nearly all 24,000 acres of potato crop on Long Island.

Farmers mixed a granular form of Temik® with the top soil prior to planting and spread an additional amount on the ground once the plants had emerged. The young plants then absorbed this substance through their roots with moisture in the soils and distributed it throughout their vascular systems to the leaves and tubers (or potatoes). An insect eating any part of the plant would necessarily consume some of the pesticide and be killed. Pesticides that work this way are called systemic. Because plants absorb them, there is no need to spray the foliage weekly. These systemic pesticides must be soluble and stable in water for root absorption to occur.

The regulatory agencies had been assured by Union Carbide that their tests showed that Temik® would degrade to harmless substances long before it reached the water table. Further, Union Carbide claimed that only miniscule amounts of this dangerous nerve toxin

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would remain in the portion of the plant to be consumed by humans. The agencies never questioned this openly.

Not everyone was assured by Union Carbide's claim of safe degradation. During the period of Temik® 's use, Suffolk County conducted a detailed study of potential threats to groundwater under Section 208 of the Federal Water Pollution Control Act.[2] At least one of the scientists who participated in the study, an expert in hydrology, expressed his concern that aldicarb would contaminate the aquifer due to its solubility and relative stability. However, this warning fell on deaf ears. The final report of the "208" study specifically exempts the use of pesticides from serious consideration, listing many other sources as areas of greater concern. No monitoring was undertaken by any of the government agencies that were supposed to be concerned either with the health and welfare of the public or with the proper use of agricultural chemicals.

In 1979, one year after the publication of the "208 study," and during the fifth year of Temik® use, the manufacturer of this toxin was persuaded to test some drinking water wells on Long Island. Of the 14 wells initially tested seven were found to be contaminated.[3] Union Carbide, startled by these findings, sent a representative to the EPA to inform the agency of the problem. Further tests, conducted under the auspices of the EPA and with the cooperation of Union Carbide confirmed these findings: a major groundwater contamination problem had been uncovered. Union Carbide claimed that this problem had arisen due to the unique characteristics of Long Island's soil and climate, and would be unlikely to occur elsewhere in the United States. Therefore, they convinced the EPA to prohibit Temik® use on Long Island only. Union Carbide contended that this would stop the contamination problem while still allowing them to market this highly profitable and widely used pesticide. However, as a result of this selective withdrawal, Temik® , which is currently used on a variety of crops including citrus, peanuts, soybeans, and cotton, has been found in the groundwater of Wisconsin, Florida, and Maine, and may be yet undetected in other water supplies that have not been properly tested. Further, Temik® residues are showing up in various foodstuffs including oranges and potatoes.

cpf

Lynn Roberson

Government Response

Public outrage spread through Long Island's East End as word of the contamination began to reach the residents. Homeowners expressed fear for their health and safety. Farmers, on the other hand, minimized the problem, foreseeing the withdrawal of what was then an extremely effective pesticide from the commercial market. Resort owners and real estate agents were afraid that too much publicity about the toxic water contamination would scare away their customers and lower the economic value of their holdings.

The government had to step in, communicate with the people living and working in these regions and adopt a tentative course of action. The federal government began by contacting state and local agencies and issued a news release describing the "emergency" in August, 1979. Although they tried not to alarm the residents,[4] EPA toxicologists urged "that the well water in question not be used for human drinking or bathing purposes."[5] Yet, the reasons were not explained to the public. Instead, the EPA commissioned four studies by independent investigators[6]: two focused on the degradation and transport of the contaminant and two on direct health impact. All work on the first two has been

made public, and they indicate that wells may be contaminated for as much as 100 years. Data and analysis for the health effects studies are still being withheld despite a Freedom of Information Request that we filed with the EPA in August 1981.

The New York State Health Department had their toxicology group review the health effects literature for Temik® and established a "health guideline" of seven parts per billion (ppb) in drinking water.[7] (EPA has been unable to take a unified stand on this issue. One office still urges an unofficial guideline of 10 ppb, another 30 ppb. Meetings to resolve this disagreement have been postponed indefinitely.[8]) No general health advisory was ever issued. The State Department of Environmental Conservation has reexamined pesticide practices on Long Island, but has issued no advisories.

Since no other agency at any level of government had warned the public nor responded directly to the well contaminations, the Department of Health Services had to accept the responsibility for direct action and for communication of human health impacts to the residents. It is only fair to point out the difficulty a local agency has in responding to an issue of this type. As is typically the case, this local agency does not have staff trained to respond to major environmental health crises nor do they have the resources to mobilize for intensive study of a particular acute problem. They normally deal only with routine health surveys and considerations or occasional infectious epidemics. Further, many local health officials are political appointees who must respond both to public pressure to explain the severity of the problem and local commercial interests such as real estate agents, the tourist industry, and even farmers who do not want the issues stressed anymore than is necessary. Yet, forced by the inaction of others, the Department of Health Services responded and devoted a considerable portion of their limited resources to the Temik® problem. Unfortunately, the Health Service Department's effort left much to be desired despite the good intentions of most of the staff members involved.

The Department of Health Services saw the need for a comprehensive testing program to warn individuals about their own contaminated wells and to document the extent of the contamination, but found themselves with inadequate equipment and resources to analyze water samples for Temik® . Instead of seeking funding from the Suffolk County Legislature for the staff and instrumentation required, they accepted Union Carbide's offer to do analytical work on a few thousand samples to be collected by Health Department workers. However, the sampling dates were constrained by Union Carbide. The sampling locations were determined by SCDHS without consideration of appropriate

"Hey, here's a drinking source that tests out pretty good. . . It has traces of water in it."

Stayskal/Chicago Tribune/Young Socialist/LNS

parameters of the groundwater flow and without routine statistical criteria. Therefore, after over 10,000 individual well tests, they still have not determined the extent or spread of the problem and have yet to account for the seasonal variation in the Temik® concentrations at any location.

The Department of Health Services failed to establish an adequate mechanism to communicate its findings to the affected residents. Initial information was passed on through the local media. A pamphlet was written with other local government groups and distributed to some concerned citizens, but since only 15,000 were printed for an estimated population of 100,000, many people did not receive one. Further, much of this information was inaccurate or misleading, implying more was known about the effects of chronic exposure to Temik® . Well test results and offers of free water filters for contaminated wells were sent to homeowners by Union Carbide rather than the Department of Health Services, causing much skepticism among residents.

Finally, the Department of Health Services did not seek nor encourage help from local scientists and local residents in researching, understanding, and responding to this problem. Instead, they barred these people access to their records, held meetings with experts from out-of-town that were closed to the public and refused to release even the well test results to the local residents. Meetings held by the Department of Health Services staff with Union Carbide officials to discuss Union Car-

bide's response and responsibility in this situation were closed to the press and to the public. Not even the Suffolk County Legislature was advised of the details of the proceedings. Residents were dissatisfied with the weak agreement reached by the Department of Health Services with Union Carbide and demanded greater compensation from the corporation they considered responsible for polluting their water.

The Politics of Public Persuasion

The authors of this article, both members of Stony Brook Science for the People, began investigating the Temik® situation in the spring of 1980. Eventually, we joined with other environmentally conscious people to help organize residents around demands for a more adequate response to this crisis. At the outset, one of us, Dan Wartenberg, who is a graduate student in the Department of Ecology and Evolution at the State University of New York at Stony Brook, became frustrated at his inability to get the Department of Health Services to test his parents' well water for Temik® . The Department of Health Services had arbitrarily restricted well tests to those within 2500 feet of a potato farm. They refused to test any others. Further, given the location of his parents' house, the officials asserted that there would never be a Temik® problem there. Dan began to look more deeply into this problem. His knowledge of local groundwater flow patterns made him suspicious of the appropriateness of this type of statement. He soon discovered that many others shared his frustrations and that many people had also been given patent assurances of the quality of their drinking water. As he began to realize that the problem was much larger than he had initially thought, he sought the help of Ted Goldfarb (the other author), an environmental chemist on the Stony Brook faculty. Together, we decided to further research and publicize the situation. Since then, it has been an ever expanding, increasingly controversial problem. Our effort, now nearly three years old, still has no end in sight. Beginning as a local issue, it has now become a problem of national concern, going beyond the contamination of a few wells to the wholesale tainting of many foodstuffs.

As we began our work, it quickly became clear that even getting information to evaluate the likelihood of human health impact would be a tremendous challenge. Our initial informal requests for data and information were rebuffed by local, state and federal agencies, as well as by Union Carbide. At the state and federal levels, we called and asked for information, but did not find officials willing to disclose adequate information to us. Locally, we asked the Department of Health Services for access to their well test data base so that we could independently assess the information that they

THE HEALTH EFFECTS OF TEMIK

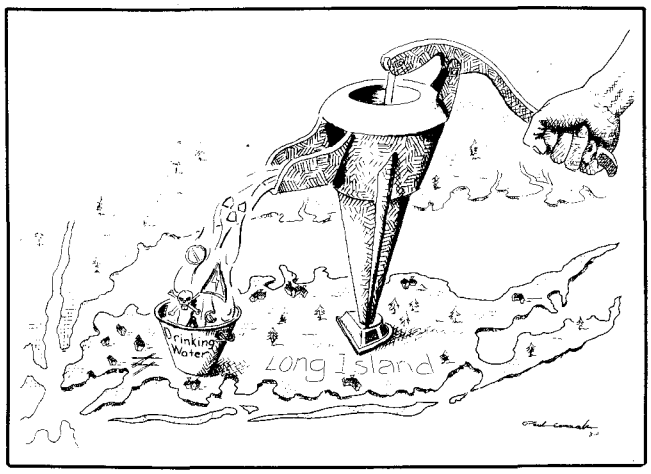
Aldicarb, the active ingredient in Temik, is a very potent chemical nerve poison. Nerve transmissions between neurons outside the central nervous system are carried by a chemical called acetylcholine. Typically, the acetylcholine is then destroyed by an enzyme (called acetylcholinesterase). If acetylcholine is not destroyed, the nerve continues to be stimulated indefinitely even though no new impulse has been generated. Aldicarb prevents the normal destruction of acetylcholine, as do many similar pesticides. Thus, people exposed to large amounts of Temik are likely to experience excessive nerve excitation. Their symptoms include dizziness, nausea, muscle spasms, convulsions and eventual death. People exposed to lesser amounts are likely to experience various impairments of their nerve functions.

Chronic effects are much more difficult to assess. Limited chronic exposure studies have not revealed any definitive connection between Temik and chronic diseases such as cancer. However, some epidemiology studies and laboratory studies have suggested a link between chronic Temik exposure and adverse health effects including cancer, neurological disorders, and spontaneous abortions.

One problem with testing Temik is that researchers cannot use the normal technique for assessing chronic toxicity. Normally, investigators expose a large number of animals to a high dose of the chemical over a short period of time. Results of these tests are then used as a basis for extrapolation to low dose, long term exposure for large populations of humans. Unfortunately, the extremely high acute toxicity of the Temik kills most of the test animals.

In addition, there is a disparity between the available toxicological data for humans and that available for other test animals. In 1970, Union Carbide asked 12 male employees to ingest aldicarb to study its effects. Scientists monitored the subjects' urinary excretions of aldicarb and its metabolites for 24 hours. Although in similar studies with rats, mice, dogs, and cows, over 75% of the administered dose is normally recovered in 24 hours, only about 10% of the dose was recovered in humans in this time period. Insufficient study has been done to determine why this disparity exists. However, it makes extrapolation from animal studies to human exposures somewhat questionable.

had collected, offer advice and suggestions for further work, and perform some of the statistical analyses that might enable someone to predict the changes in Temik® levels in private wells. The Department of Health Services found this request unreasonable, despite our training and expertise in these areas and despite their admitted lack of qualified personnel to perform these analyses. They claimed that general release of this information would reduce real estate values, cause general panic among the residents, and provide sufficient information for vendors of water filtration and purification units to harass residents who had contaminated wells. They claimed that private citizens could not be trusted with this information. We offered to sign an affirmation that we would not use any of this information for commercial purposes and that we would not use it or release it to others with intent to obtain personal profit. The Department of Health Services refused this proposal as well. We then filed formal Freedom of Information requests under the appropriate state or federal statutes with each of the agencies involved. They still refused to provide all but a fraction of the information on Temik® that they have in their files.



Paul L. Cornacchini

At this point, we decided an entirely new approach was needed and chose to focus our attention on the local agency, the Department of Health Services. Since pressure from individual residents and local scientists was insufficient to persuade these officials to be open and forthright with the public, we decided to try a broader, more direct public pressure approach. We took what information we had collected from these various agencies, from the scientific literature and other sources, read it, analyzed it, and wrote a critical evaluation.* Rather than question the scientific studies or opinions we had collected, we pointed out inconsistencies, contradictions, and inadequacies in the understanding of this dangerous chemical and the water contamination. We concluded our critique with a set of specific recommendations which, if implemented, would help the public understand the problem and minimize their health risk. Once we completed our report, we sought the assistance of some local politicians. We convinced one member of the Suffolk County Legislature of our concern, sincerity, and the veracity of our claims. He organized a press conference for us where we released our report.[9]

The reaction was strong and immediate. A local New York City television station interviewed us as well as some Union Carbide officials. The local community papers featured the release of our "highly critical" report as front page news, and local radio stations broadcast excerpts from it. Oddly, however, Long Island's major newspaper, *Newsday,* refused to print any mention of the press conference. Their explanation for pulling the story just a few hours before publication was obtuse. We suspect they were concerned about the reaction of wealthy East End real estate and resort owners, and the newspaper's relationship with Suffolk County Department of Health Services as a news source.

Official response was quite caustic. The Department of Health Services issued a vitriolic response, attacking our credentials and using vague innuendos about the credibility of our work. Yet, since our study was abundantly referenced, and did not claim any new scientific evidence, but rather, reviewed existing and easily available information, they did not question any of our specific claims, only attacked the general nature of our approach.

Concerned citizens formed a group, called Citizens Concerned About Temik® Contamination, intending to organize and educate residents who were still unsure of the potential impact of the contamination. They decided to communicate individually with their local politicians to urge them to begin some official inquiry and response to the problem.

Following these actions, the Suffolk County Legislative Health Committee became concerned about Temik® , the strong criticisms that had been leveled against Department of Health Services and its open hostility to our efforts in the local press. They invited us and the commissioner of the Health Services Department, David Harris, and members of his staff to attend a meeting in March 1981. We presented and discussed the criticisms as did the Health Services Department. Many members of our citizens group attended this meet-

*The main document we focused on was the first Suffolk County Department of Health Services status report on Temik® , released in September, 1981.

ing also, expressing their outrage at the manner in which the department had handled the problem, including their failure to provide adequate information and warning to residents. In response to requests from various citizens groups, the Legislative Health Committee decided to create a special subcommittee to specifically study this problem and to hold a series of meetings to hear the public's views. These were held in April and May of 1982.

The hearings were well attended. Representatives from Union Carbide, the Department of Health Services as well as the legislators were confronted by the criticisms, comments, and suggestions of those attending. Although the Department of Health Services had not tested any wells since the summer of 1981, they still claimed to be in total control of the situation. They announced a new, expanded well test program to chart the spread of the Temik® . Still, however, no statistical criteria were used in the design, no study of general groundwater flow was suggested, and no direct effort to communicate with and warn residents was included. The Suffolk County Legislature is now evaluating the results of the hearings and considering taking further action.

As a result of the increasing publicity for the Temik® contamination on Long Island, Bill Moyers of CBS National News picked up the story. With some additional research, his staff soon learned that the problem was not confined to Long Island. Temik® was being used all over the country and on many different crops. Press stories began appearing in Wisconsin, Florida and elsewhere, pointing out groundwater contamination problems and raising the issue of large scale contamination of potatoes, citrus fruits and juices, soy beans, and other foodstuffs. Research has just begun to estimate the hazard that this may pose.

The Fight Continues

It is too early to assess whether the new Health Services Department program will be a significant improvement over past efforts. They are developing their own, independent testing facility. They have released some of their information and well test data to us. We are now analyzing that data.

It is also too soon to evaluate the health effects on people living in the contaminated region. One preliminary study indicates an increase in birth and nerve disorders.[10] Another indicates other possible abnormalities.[11]

Union Carbide has agreed to provide activated carbon water filters to people with wells contaminated at levels above the state health guideline. However, maintenance charges for these filters (about $125 a year) are now borne by the well owner. The Department of Health Services is urging Union Carbide to assume these costs.

Locally, our efforts are continuing. Citizens Concerned About Temik® Contamination is educating and organizing more people, trying to bring additional pressure to bear on local officials. We are actively pursuing our Freedom of Information requests and are trying to use the expertise of local law students to force these government agencies to abide by the law. We have also applied for funding to continue our research. Our eventual goal is to get all the information on Temik® into the public domain, for a careful independent assessment. However, this will take time. Until then, based on our analysis of the toxicology data, we are pressing for a complete suspension of the use of Temik® on food crops or in areas where water contamination is possible.

Other organizations have joined our struggle. The Natural Resources Defense Council (NRDC) has focused the efforts of their pesticide team on Temik® . They have aggressively pursued their Freedom of Information rights and taken EPA and Union Carbide to court. As a result, they have recently been granted access to much of the data. Once they have received all of the data Union Carbide submitted to EPA to register this pesticide, NRDC plans to hold an independent peer

CHECKLIST FOR ACTION

Learning from our experiences with Temik, we have developed a rough set of guidelines for residents who find themselves in a similar situation. Activists should seek support from the public treasury and enlist the aid of other agencies and technically trained individuals to implement as many of the following as possible:

- conduct a thorough, carefully planned testing program to determine the source, present and future extent of the contamination;
- develop direct lines of communication with people living in the affected area to keep them informed of the hazard and how they can minimize their health risk;
- work with affected residents to obtain full financial remuneration;
- learn all that is known about the potential health effects of the contaminant;
- encourage and work with local researchers who volunteer their expertise;
- promote an educational and regulatory program designed to prevent future contamination.

review of this dangerous nerve poison. They want to assess the danger it poses to the health and safety of the public. Friends of the Earth has submitted a petition to EPA calling for banning the use of Temik® nationally. Other groups have also expressed interest and support.

Our confrontation with one of America's corporate giants has been an intense, frustrating experience. We began by trying to get local officials to perform their routine tasks of testing the safety of our drinking water, but we got maligned in the local and national press, and industry publications. The chemical is still marketed nationally, and we still have difficulty getting even local officials to speak to us on the telephone. But the Department of Health Services has reoriented their sampling policies and enlarged their laboratory capabilities. We have educated many people about the dangers of Temik® . They now see the limited response a corporation feels obliged to make after creating a major environmental health hazard.

Public pressure and political organizing have enabled us to begin to get information to evaluate the problem. But only through constant pressure can we counteract the tremendous power and resources of a corporate giant working to sustain the marketability of a multi-billion dollar product.□

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ALTERNATIVES IN AGRICULTURE

A Report from the New World Agriculture Group

by Uriel Kitron and Brian Schultz

For fifteen years *Science for the People* has asserted that a science truly for the people must also be done with and by the people. Progressive scientists must form close alliances with working class organizations such as progressive unions in order to find out what their interests are, rather than attempt to impose our conceptions from a distance. We must help facilitate radical organizing and learning that challenge exploitive power relations. Progressive scientists support democratic, socialist countries in their struggle against imperialism, by seeking to develop technologies that reduce their dependence on hostile, developed nations, and by helping them to avoid some of the ecological mistakes made during recent capitalist developments.

This support work includes exposing the class-based nature of current technologies, but further, it includes researching, developing, and publicizing alternative, "transitional" technologies that do not represent the interests of the ruling class, but aid in the struggle for liberation by oppressed classes. Such technologies will serve as a tool for workers to achieve lasting gains, and must not substitute for or hinder progressive social change. The so-called appropriate or alternative technologies are often appropriate only in a technical sense, and often ignore the social, political, and economic changes.[1]

In 1977 a group of progressive North American scientists formed the New World Agriculture Group (NWAG) to develop transitional technologies and encourage progressive agricultural initiatives. NWAG (pronounced ("new-ag") has chapters in Ann Arbor, Berkeley, Boston, Ithaca, and Montreal, as well as active individuals in other cities. Most of us are ecologists, social scientists, or public health practitioners associated with universitites, and many of us are members of Science for the People. NWAG attempts to find and develop alternative methods of agricultural production that are ecologically rational, in the sense of protecting the environment and preserving long term productive capacity, and that help bring an end to the exploitation of workers and the unequal distribution of wealth. We reject the myth that science and technology are neutral or apolitical. Throughout history, technology has often been developed to strengthen the position of a small elite, at the expense of oppressed people. Mechanization as a weapon to control labor is perhaps the most familiar example, in agriculture as well as industry.[2]

In this article we present two examples of current attempts by NWAG to put some of these ideas into practice. NWAG has begun a program of collaboration and technical assistance with the people of Nicaragua. Decades of mismanagement under the Somoza dynasty, damage from the war, and finally, the flight of capital following the revolution which overthrew Somoza in 1979, have all crippled production and left Nicaragua with huge debts.[3] NWAG hopes to aid the Nicaraguans to rebuild their agriculture by increasing food production for all the people and by minimizing dependence upon expensive, imported chemical inputs, such as pesticides and inorganic fertilizers.

Since 1977 members of NWAG and Science for the People have been actively supporting the Farm Labor Organizing Committee (FLOC)[4] by writing articles, fundraising, teaching, campus organizing, and more direct action (for example, locating tomato fields for picketing; helping on picket lines; talking to other labor unions). Building upon this foundation of political work, we have directed our research toward studying methods of agricultural production that may be useful

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in FLOC's struggle by, for example, opposing the spread of agricultural mechanization as a means of breaking labor unions. We also recently began to work with FLOC in the Farm Labor Research Project (FLRP), collecting and evaluating information about pesticides and farmworker health and safety in the mid-western United States.

Collaboration with Nicaragua

In February of 1981, nine NWAG members visited Nicaragua. At various informal meetings with agricultural officials, we discussed what sort of technical support we could offer to aid in the development of agriculture in Nicaragua, and we submitted a proposal to the appropriate government agencies. An official NWAG delegation was subsequently invited to return to Nicaragua, and a program of collaboration between Nicaragua and NWAG was formally established (see box).

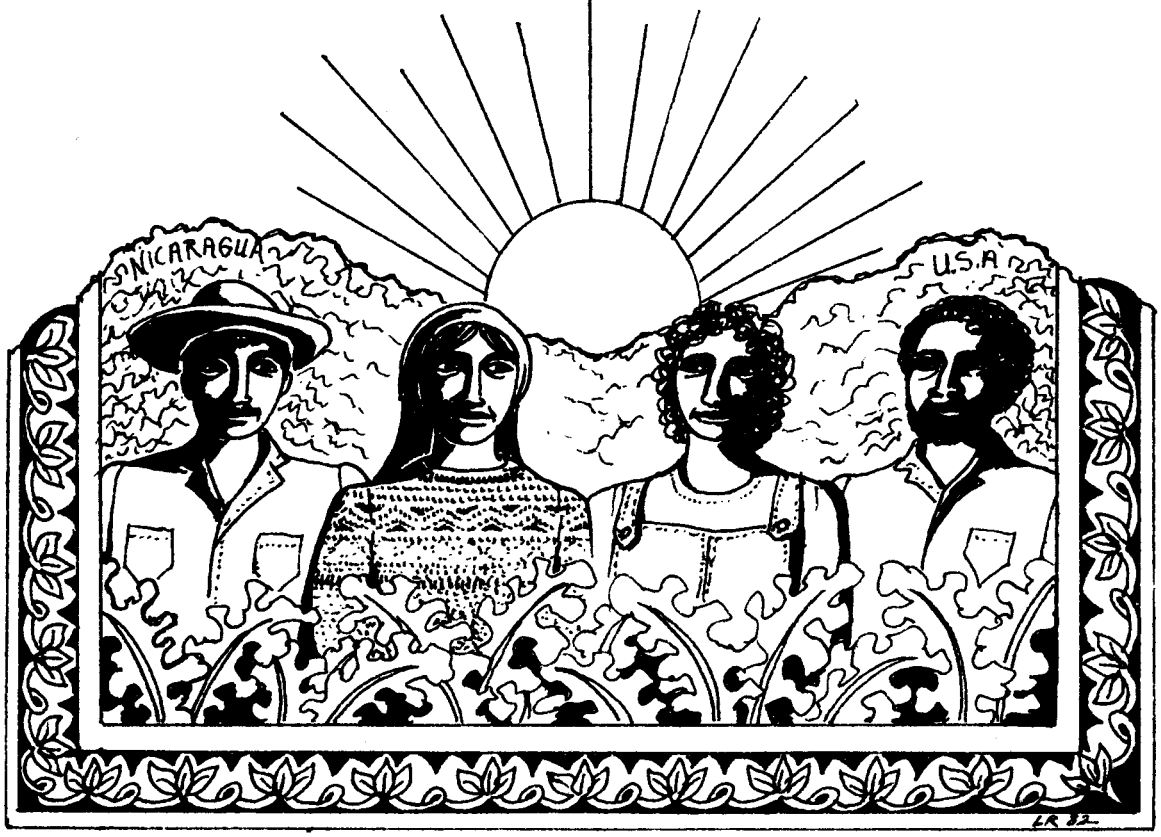
Nicaragua is one of the most underdeveloped countries in the world. As in other Third World countries, Nicaraguan underdevelopment is a product of both the development of the First World at its expense, and its continued dependency on the First World. The Nicaraguan economy was based on cash crops for export, such as coffee and cotton, which enriched the few, rather than basic food production and the kinds of industrialization which meet the needs of the majority of the people. Nicaragua remains heavily dependent on cash crops for foreign exchange to repay debts and rebuild the country, while at the same time attempting to develop self sufficiency in basic needs.[5]

Statement of Purpose for Collaboration Between NWAG and the Nicaraguan Government

1. To aid the Nicaraguans in their efforts to develop agriculture in a manner which is in harmony with the revolution's goals, by:
   a. increasing yields, both in terms of food production and economic value,
   b. reducing the vulnerability of the agricultural system to natural disaster and economic uncertainty,
   c. developing a technology which protects the health of agricultural workers and the environment.

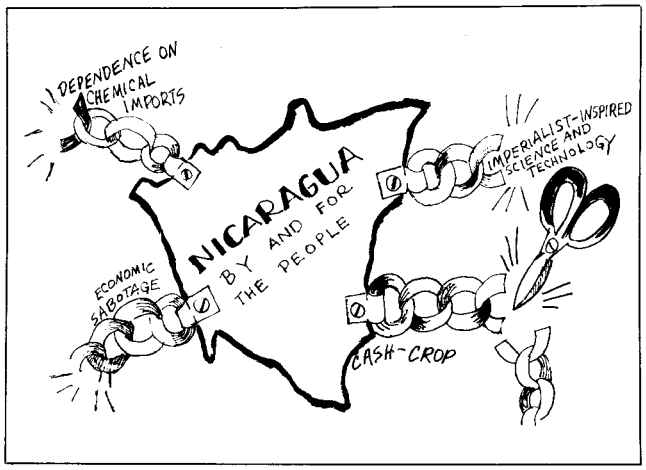
2. To help develop the scientific community in Nicaragua so as to achieve intellectual autonomy free of dependence on imperialist science, promote the integration of theoretical research with the achievement of practical goals, and encourage the kind of science which can see technical problems in their social and human context.

3. To express our own solidarity with the Sandinista revolution and defy any blockade which the U.S. government may impose.



Lynn Roberson

One major problem that the Nicaraguans face is their heavy dependence upon expensive agricultural chemicals frequently imported from unfriendly sources such as the United States.* Modern methods involving large, highly mechanized monocultures and a great deal of pesticides and fertilizers are especially risky in countries with limited technical and financial resources.



Beverly Chorbajian

NWAG sees its interest in alternative agricultural methods as one way to help Nicaragua reduce this "window of vulnerability."

NWAG has begun work in Nicaragua on these problems. One of our members recently completed a year assisting in an evaluation of development in the Atlantic Coast region. Another has joined a research team studying corn and bean leafhopper pests. Others will help to develop programs of integrated pest management, emphasizing nonchemical means of control, and will help to breed vegetable varieties that are resistant to local pests and diseases. We are conducting experiments with intercropping (planting more than one crop in the same field at the same time) because this simple method alone often increases production and reduces the impact of pest insects.[6] NWAG members have previously studied intercropping and insect ecology in Mexico and Costa Rica.[7] In another aspect of our work, we collaborate closely with Nicaraguan researchers to carry out literature searches in the U.S. on subjects about which Nicaragua lacks technical information, and to send relevant books and reprints. For example, Nicaraguan researchers recently incorporated a NWAG bibliography of the peach palm into a government agricultural extension bulletin.

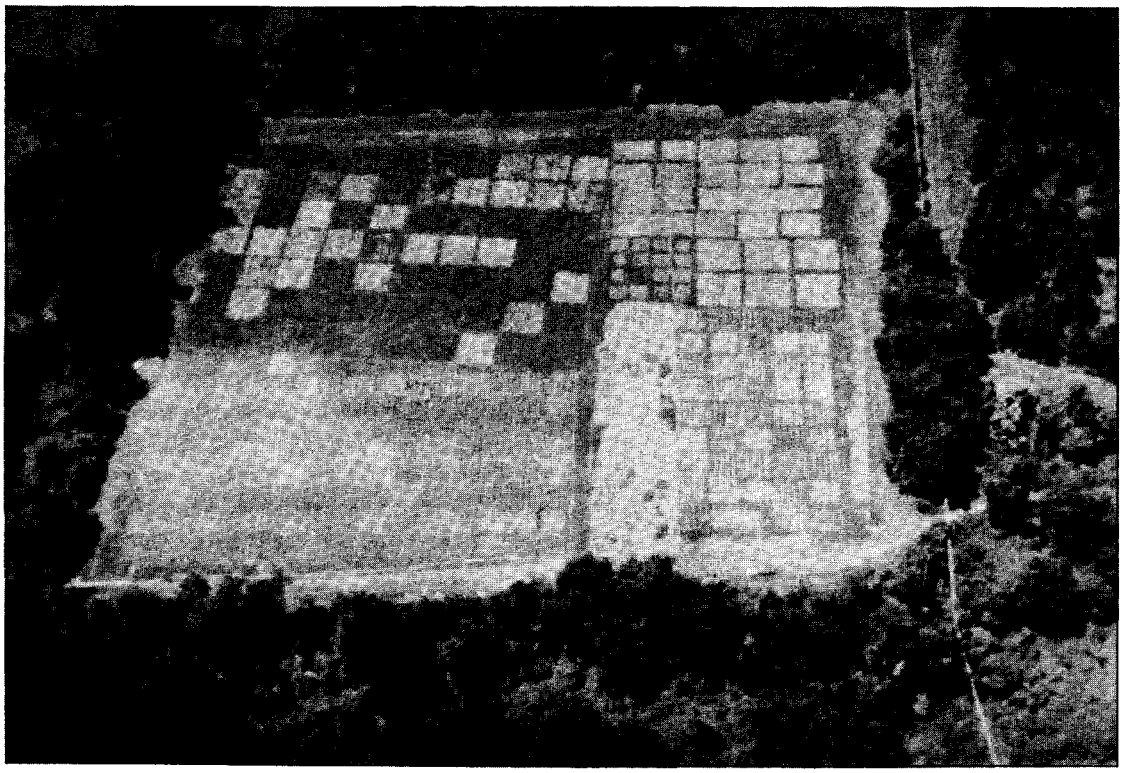
Some progressive scientists may argue that Third World liberation will best be furthered by U.S. citizens restraining their own government. However, given our advantages (such as extensive libraries), researchers from the developed countries are able to help countries like Nicaragua meet needs that they cannot as effectively meet by themselves at present. Since these advantages were ultimately obtained largely at the expense of underdeveloped nations, such collaboration seems not only proper but long overdue.

*One way that the U.S. destabilized the Allende government in Chile during the early 1970s was by cutting off the import of supplies necessary for agricultural production.

Cooperation with the Farm Labor Organizing Committee

After working with FLOC for several years, NWAG members decided to choose areas of research in ecological agriculture that might be helpful in FLOC's struggle against tomato mechanization and related technologies used in the tomato fields. While FLOC members do not oppose in principle mechanization as a way of reducing the amount of tedious work needed to grow food, they realize that agricultural mechanization has often been used to break labor unions.[8] One common effect of mechanization has been to displace migrant workers who, by becoming organized, present a threat to current labor practices. FLOC insists that farmworkers as well as growers should benefit from mechanization (through shorter hours, less child labor, retraining and placement in new jobs, and other methods) rather than simply being cast aside when their services seem expendable. Finding feasible alternatives using hand labor could slow the spread of job-displacing mechanization.

Intercropping has the potential to be one such method. Researchers in NWAG have found that intercropping is usually more productive and more labor intensive than monoculture cropping. Although it has been associated with the tropics, intercropping was also well known in the midwestern U.S. until the advent of mechanization in the 1940s made large monocultures more profitable to large investors.[9] At present most intercrops cannot be harvested mechanically. Existing harvesting equipment (except in the People's Republic of China[10]) has been developed with one crop in mind. Intercropping thus seems to offer a way of maintaining jobs for farmworkers as well as producing higher yields than mechanized monocultures. Even if mechanical harvesting methods for intercrops can be developed, the delay in developing such techniques would at least give FLOC more time to grow and organize. Failures to incorporate successful intercropping techniques can be publicized to illustrate the true goal of processors—breaking labor unions. Thus we have attempted to use intercropping as a useful, transitional technology serving the cause of farm labor.



NWAG

Aerial photograph of experimental plots in Ann Arbor.

An agricultural produ
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Starting with the 1980 growing season at the University of Michigan in Ann Arbor, we decided to experiment with the intercropping of tomatoes with other crops commonly grown in the Midwest, first cucumbers, later soybeans. Cucumbers, like tomatoes, are a high-risk, high-return crop usually grown second in priority to grain crops in the Midwest as a chance for extra profits. Intercropping has sometimes been found to reduce risk beyond that obtained simply by growing more than one monoculture.[11] Furthermore, as legumes, soybeans can serve to convert atmospheric nitrogen to a useable form for a nonlegume "companion" crop such as tomatoes.

The preliminary results from three years of experience have been promising. Tomatoes and cucumbers as well as tomatoes and soybeans have yielded as much as 31% more overall when grown together in our small-scale experiments. We have, however, been too slow in publicizing at a popular level our results and the potential advantages of intercropping in general. Several of us have begun to devote more effort to writing articles for local grower magazines, attending and speaking at farmers conferences and poster sessions, and setting up trials on commercial farms and on land rented specifically for large-scale demonstrations. Perhaps because our backgrounds are in the basic sciences, we have tended to become overly mesmerized by scientific minutiae, at the expense of paying sufficient attention to popularization. We do hope that if intercropping proves feasible in production, farmers will find it to their advantage to join in a just solution to the conflict between farmworkers and processors, rather than switch crops or attempt to mechanize the problem away.

The Farm Labor Research Project

More recently, NWAG began to work with the Farm Labor Research Project (FLRP). Initiated by FLOC in 1982, FLRP (pronounced "flerp") is a research and public education effort focused on the problems of migrant farmworkers in Ohio, Indiana and Michigan. Working in cooperation with FLOC, the project coordinates research on migrant living and working conditions, wages, and the impact of mechanization on jobs. FLRP, NWAG, and SftP jointly established a "pesticide task force," and NWAG and FLOC support group members have started working on specific issues affecting farmworker safety. We study methods to monitor the use of pesticides, exposure of

NWAG

n cooperative in Nicaragua. Lack of modern equipment means that on cooperative on Lake Managua irrigate melons with buckets using ug wells.

workers to pesticides, the impact of pesticides on agricultural pests, and the development of alternative technologies such as intercropping and biological pest control. FLOC uses this information for outreach and community organizing programs within and outside of the farmworker community.

FLOC has been interested in training organizers to quickly recognize, document, and report specific cases of pesticide-related accidents and violations for use in publicity and, possibly legal actions. The FLRP pesticide task force has collected information about the pesticides that are used on tomatoes in Ohio and Michigan. Our initial findings were presented as a reference manual and in a set of talks at a meeting of FLOC organizers in Toledo, who were preparing to go into the field to talk to workers. The manual includes a brief description of the pesticide problem, symptoms of pesticide poisonings, and health and exposure effects of the 40 or so pesticides currently in use in tomato fields in Ohio. The manual concludes with a brief discussion on the excessive use of pesticides, and potential alternative methods of pest control.

In the presentation by the task force to farmworker organizers, discussion focused on information useful in organizing. We discussed common pesticides and their poisoning symptoms, pesticide package labels and poisoning information, legal rights with respect to pesticide use, the loss of effectiveness of pesticides (due to pest resistance and the destruction of beneficial insect predators[12]), and alternative methods of pest control. We emphasized that pesticide regulations are rarely enforced, and that only organized workers can expect to obtain real improvements in working conditions. We showed how, given the existence of alternatives, exposure to pesticides need not be accepted as an unavoidable part of a farmworker's job. We ended our talk by describing how chemical and food processing companies are interested in profits, not controlling insects[13] or protecting farmworkers.

We gave a similar presentation for a conference of farmworkers in Holland, Michigan; others are being planned. We are also producing pamphlets, slide shows,

Resolution from FLOC's 2nd Constitutional Convention

Whereas, many of the pesticides used in the Midwest are highly toxic, both in terms of acute toxicity and in terms of long range effects, such as cancer and birth defects, and

Whereas, farmworkers are continuously exposed to pesticides, and suffer from illness, disability and reduced life span, and

Whereas, farmworkers are often exposed to pesticides without their knowledge and consent, and

Whereas, cases of pesticide poisoning typically go untreated, unreported and uncompensated, and

Whereas, the use of pesticides results in environmental destruction and

Whereas, effectiveness of pesticides is often questionable, and can even make pest problems worse,

Therefore be it resolved that FLOC denounces the indiscriminate and unnecessary use of pesticides in the Midwest, and

Further be it resolved that FLOC calls for strong regulations regarding the use of pesticides, exposure of farmworkers to pesticides and compensation in the case of pesticide poisoning,

And be it further resolved that FLOC voices support for the development of alternative methods of pest control,

Furthermore be it resolved that a permanent task force be developed by the Farm Labor Research Project and FLOC to study pesticide effects, to educate our members and to take action in appropriate ways on this crucial issue.

and other media to spread information about pesticides, health effects, and the legal rights of farmworkers in the Midwest. This aspect of FLRP is part of assisting the FLOC organizers, but we hope that the project will also generate mutual participation and enthusiasm on the part of organizers and farmworkers.

Future Plans

On a longer term basis FLRP plans to address more than just the problem of the safe use of pesticides. We have begun to question the use of chemicals in agriculture in general. FLRP will challenge the use of pesticides over alternative methods in its research. In addition to intercropping, for example, biological control has been shown to be feasible in processing tomatoes in California.[14] Many of these pest control alternatives can also result in additional jobs.

NWAG hopes to set up a series of demonstration areas in which farmworkers can obtain hands-on experience with proper pesticide use, hazard monitoring and methods of transitional technology. While intercropping and biological control are not new ideas, we consciously seek to use them where they may support such struggle. For this purpose we are applying for grants to rent a series of parcels of land located in counties in which farmworkers are highly concentrated (such as Putnam and Henry counties in Northwest Ohio). In this demonstration project the skills of NWAG members and farmworkers can be combined to challenge the present agricultural practices on several levels. They will include an integrated pest management program for tomatoes, techniques of insect sampling and identification, and other field pest management skills. These plots will also be used to demonstrate the possible hazards of pesticides such as drift and persistence. Small demonstrations of tomato-soybean and tomato-cucumber interplanting will be used to demonstrate how methods of cultural control can give bigger yields and reduce the need for using pesticides. These demonstration farms will hopefully provide a basis for research programs in which farmworkers and scientists can collaborate on all aspects of agricultural research.

Finally, labor-intensive but productive technologies might benefit farmworker cooperatives, offering a progressive alternative to the large, mechanized farms that are steadily pushing smaller farms out of business.[15] Such cooperatives have already been established in California.[16] Alternative agricultural technologies like those described here may be one way to increase their ability to survive and compete in a hostile, capitalist environment. FLRP provides us with a program of political action to implement the theoretical outlines of groups such as NWAG and Science for the People.

In summary, NWAG attempts to use our knowledge and skills as agricultural scientists to contribute to work that promotes progressive social change, such as strengthening the position of Midwestern farm labor or Nicaraguan revolutionary independence. It is important to take our direction from meaningful collaboration with the organizations with which we ally, rather than attempt to impose our misconceptions upon them, as "experts" have too often done in the past. In this way NWAG hopes to pursue not only science for the people, but also science with the people and by the people. □

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Science for Women, Too

NEW DIRECTIONS IN SCIENCE EDUCATION

by Nancy Lowry and Ann Woodhull

Of the many conflicting claims about the situation of women in science, the most insidious is that the predominance of men in science reflects some form of "sexual selection"[1]—women lack the "math gene,"[2] or they tend to think with the wrong half of the brain.[3] Studies we have seen to date that shore up "sexual selection" reveal faulty methodology, either due to bias in experimental design or far fetched extrapolation of data.

Our own story, as well as the stories of many women,[4] suggest that the barriers to women in science are not biological, but social and political. Science is a community endeavor. Scientists who wish to achieve in their fields are dependent on others for access to equipment, and for exchange of ideas, students, and the latest research results. Science has succeeded, however, in building up an exclusive community, with styles, values, and biases; for the most part, women have not been made to feel welcome. Indeed, most women can recall instances of a science professor showing a slide in a course or lecture of a woman portrayed with sexual connotations. These instances forge a community of male students; it is very clear who is not included.

Science Education at Hampshire College

Hampshire College,* a small experimental college in Amherst, Massachusetts, has been successful in drawing an equal percentage of women and men students into its science program, an unusual accomplishment for a coeducational school. One of us, aided by a grant from the Fund for the Improvement of Post Secondary Education, recently conducted a study of the college science program to identify some factors that bring women to major in science.[5] The main goal of the study was to find conditions in teaching and conducting science which allow everyone to follow through their interests and be incorporated into the community, according to her/his abilities and inclinations.

Importance of Mentors

Due to the high percentage (40%) of women faculty in Hampshire's School of Natural Science, role models loomed as an obvious answer to the high enrollment of women in science. The first phase of the study analyzed the role of gender in student choice of faculty. It was immediately clear that the women students seek to work with**, women faculty more often than men students. The Natural Science faculty was 60% male and 40% female; women students chose to work with women faculty 50% of the time. Men students chose to work with men faculty 70% of the time. Our women students concentrate mostly on the biological, biochemical, and health related areas. (This is where most of our women faculty teach, also.)

Faculty and students, men and women, were interviewed to gain insight into the meaning of these statistics. The role of women faculty members as mentors was stressed repeatedly by students. Phrases like, "it was important for me to work with a woman," . . .

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*Hampshire was designed and established by neighboring institutions Amherst, Mount Holyoke, Smith Colleges, and the University of Massachusetts, and first admitted students for Fall 1970 enrollment. Today there are 1,250 students enrolled at Hampshire.

**Since Hampshire students' programs are all individually designed in close consultation with several faculty members, faculty/student relationships are close and generally very important for the success of a student's work.

"she had been there before," . . . "she knew what it was like," were common. From a senior marine biology student:

> Role models are important whether you admit it or not. I don't feel that I am necessarily patterning myself against anyone but if Cole Science Center were filled with men profs, I probably would be doing something else. There are obvious, important, vocal women professors here that are concerned and aware of the difficulties their students are facing because they faced them too. That is an important bond.

For many of the same reasons, the presence of a strong woman dean (1973–1977) of the School of Natural Science was cited by women faculty as crucial to their careers and sense of themselves as scientists. Women help other women feel at home.

Curricular Innovations

The study results also suggest that the type of introductory science courses offered are an important factor in women's choice of science as a major. At Hampshire, a student's first Natural Science course is a small seminar focused on a fairly specific topic. Therefore, women students are able to start with their own questions (about women's health, for example), or they find courses that articulate their own questions for them. The Biology of Women, Human Movement Physiology, and Topics in Cancer Research are a few titles from recent course catalogues. All courses are laced with science and are interdisciplinary in nature; many arise out of personal or social concerns. Some of these courses, such as Biology of Women, attract large numbers of women students.

The interdisciplinary approach in introductory science courses seems to make a big difference to Hampshire students, especially women. The use of primary scientific articles and individual laboratory projects in the teaching of these courses is important for women science students. They gain confidence; they find they can read a journal article and criticize it. They find out that they can understand science and it can be beautiful or elegant, wrong or biased, or perhaps even an example of just plain lousy research. "You are encouraged to act like a professional from the very start," one student mentioned.

Competition in Learning

A third theme that emerged in the study is that women will shy away, sometimes in disgust, sometimes for lack of confidence, from teachers or situations that make them feel dumb. They admire faculty who are strong in their fields and nurturing in their support of students' efforts. Systems that foster frenzied competition among students, or even between faculty and students, were heavily criticized by women students interviewed and answering questionnaires for the study. Competition can emerge even during Hampshire courses (Hampshire students are evaluated by narrative evaluations, not letter grades, and one of Hampshire's goals is to foster student growth in a noncompetitive environment) if allowed to develop by the faculty:

Nancy Lowry

> People rushed around in labs to get done *first.* It's probably the most competitive course I've taken. There is a "one of the boys" kind of attitude. There is a feeling of "Oh, yeah, you are one of us," but no feeling of collaboration. The situation even produced unsafe conditions in the laboratory because of the haste and competition to be finished first. There was open talk about who was the best and students competed to *be* the best.

But the effects of competition were more often felt in courses taken off-campus where pressure for grades made the situation intolerable.

Women students are very sensitive to environments, such as predominantly male classes, that make them feel unwelcome or odd person out.

I went on leave to escape the security of Hampshire and the area. At Arizona I was appalled by attitudes of the people there. Many thought I had come to find a future husband among the other students there. When they found out that I was as intelligent as the male students, they thought I must be a genius. I think this dichotomy is true everywhere in the physical sciences. People don't expect much from the women students so that when they do do science as well as other students, they are considered special.

I did not like the competition. There was cheating and backbiting and I was the only woman in the chemistry and biology courses. (She was in the advanced program.) The men lived in the same dorm, they all worked together; I had to work alone. I left after two months.

Teaching Styles Examined

The data as well as personal experiences suggest different teaching styles may be attributable to men and women. All of the women faculty interviewed for the study mentioned that they were uneasy or performed poorly when encouraged to pattern their teaching after the styles of senior men faculty, and that they knew early in their teaching careers that they needed to develop their own independent teaching styles.

A small group of Hampshire faculty, the Women and Science Discussion Group, has been meeting weekly for the last several years to discuss women's issues in science at Hampshire. This group has identified three teaching styles and suggests that they are primarily masculine in character; these terms—male and female—are used as general terms recognizing that there is a good deal of overlap.

The first model has been called the "quiz kid" model and elicits competition in the students. It is characterized by the teacher seeking a single "right" answer to a question, giving the class two-thirds of the answer, and looking for a *quick* reply. "Rightness" is absolute, and little or no attention is given to the fact that wrong answers are often partially right or to understanding why a certain answer has been offered. Right answers are made to seem good in a moral sense;[6] "wrong" answers (or possibly no answer) are seen as morally bad. For women who might work more comfortably in a reflective rather than a quick answer manner, this teaching style can lead to negative attitudes towards themselves, their ability to do science, and even their ability to think effectively. If the teacher is perceived as valuing only the "right" answer, and if the student is in strange territory, the potential for a destructive effect on student self-confidence is high.

The second competitive (and aggressive) model the discussion group identified is called the "gladiatorial spectacle model." Polarization is one of the goals of this style and it involves two faculty members having a go at each other from different sides of a question. In fact, any question that arises is deliberately polarized in a debate. If the debate is honest and there is no competitive or aggressive edge to the situation, it can be a rather good teaching tool. Honest argument involves both sides listening in an open way and the potential for either to change his or her mind. Too often, however, the competitive aspects of the show win out. Personal innuendos become inextricably bound up with the subject matter, the issues become subordinate to the debate, and the focus of the class shifts to the debators, who become involved in maintaining their positions and status in the eyes of the class. All of the women faculty interviewed in this study felt fairly uncomfortable with team taught courses of this kind.

As previously mentioned, polarization is one of the goals of teaching in this style. Students, especially women, can be hesitant to enter the debate and are thus encouraged to be passive observers. It is important for women students to learn to take strong stands and defend them; a supportive teaching style which supplies positive (not negative or neutral) reinforcement for students' ideas works better in developing this ability.

A third style which should be mentioned is the "Big Star"—that of the lecturer who has a really winning style, and will do anything to maintain his/her image. (For example, at a recent conference on teaching chemistry to premedical students, one of the invited lecturers, a faculty member from an Eastern women's college, made a joke using sexual imagery with respect to a particular woman student in order to amuse the audience.) One of the pitfalls of this teaching style is that the adulation of the audience can become all-important to the teacher, to the exclusion of the subject matter or the students' development.

There is nothing intrinsically wrong with these styles if carried out with integrity and thought for the student. However, too often the use of these styles sets up a definition of scientific community which closes out many students and certainly many women.

Women faculty at Hampshire are developing a number of different teaching styles. As part of this process, women have identified some of the pressures to use traditional teaching styles they felt uncomfortable with, then experimented to find their own individual styles. Most women interviewed in the study or taking part in the Women and Science discussion group seemed to favor a combination of lecture and discussion, with a strong component of individual attention to each student. An important thread that runs through most of

these styles is the role of teacher as nurturer. Women seem cognizant of the integrity of each student in the class and his or her potential to learn, and love, the material.[7] They not only impart "facts," but also encourage critical evaluation of the facts and the settings from which they were derived.

Seminar for Women Science Students

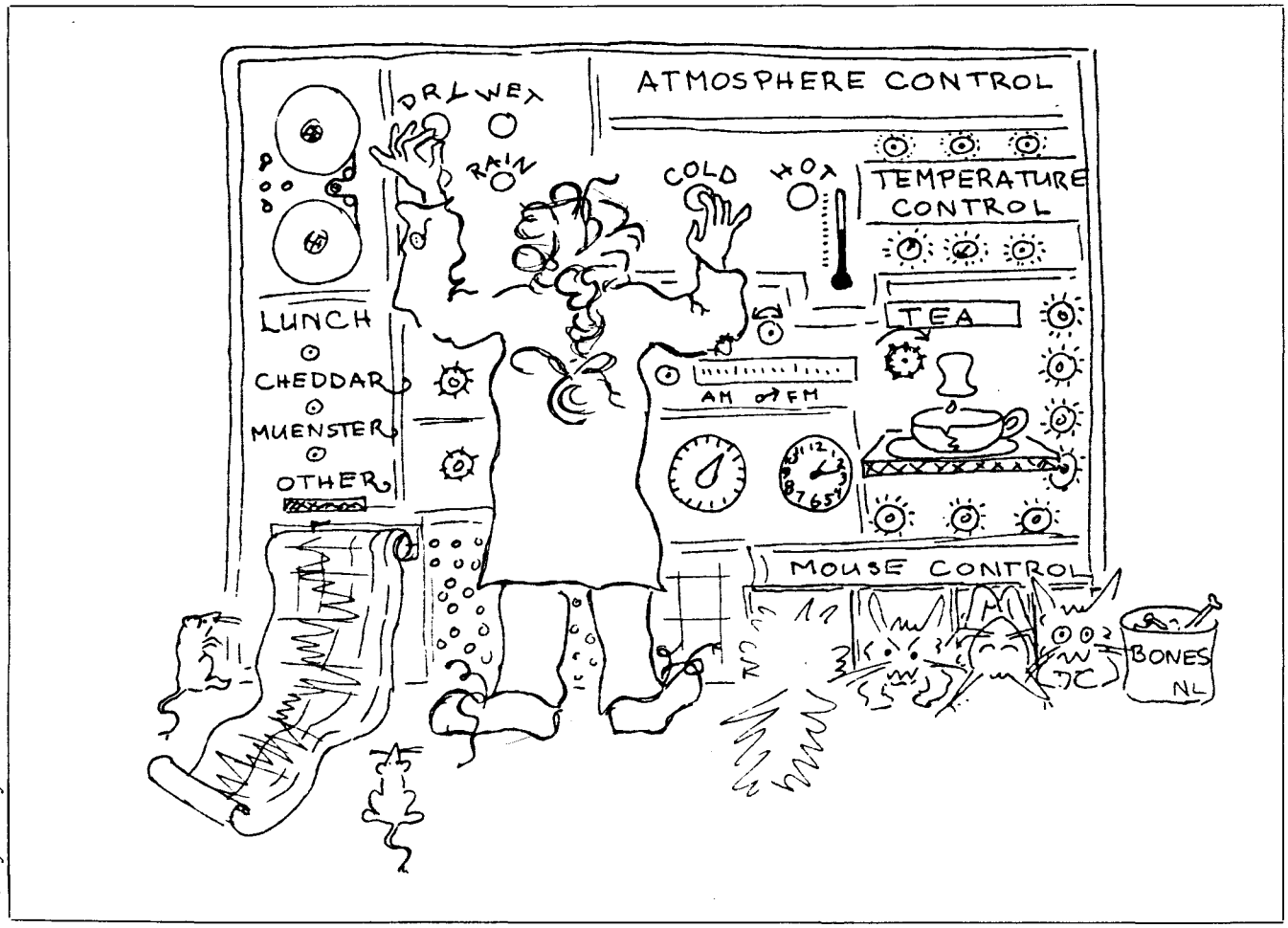
Hampshire offers an upper level seminar to women science students.* A major consideration of the seminar is what women feel they need to know in order to be successful scientists (See box).

Some of the issues the seminar focuses on are: the lives of women scientists, issues of pay and sex discrimination, practical issues of working in science, such as child care, lifestyles, and life choices, and how science might be different if more women shared control.

When students read *Body Politics,* by Nancy Henley, a book which gives an overview of women's situations, they immediately identify situations in which subtle gestures or other forms of nonverbal communication have made them feel out of place. Many of the signals given for "inappropriate" behavior are nonverbal rather than verbal; this book raises important discussion about who is "in" and who is "out" of a group, and how one knows it.

In another section of the seminar, the class reads feminist critiques of science, particularly of biology. Most of these are from the book *Women Look at Biology Looking at Women.* In examining these critiques of the methodology and intent of such fields as research into sex differences, students come to see how science can be influenced by the culture in which it is embedded. The very questions that scientists ask—for example, in research into sex differences in "aptitude," or studies of enzyme differences in racial groupings—are certainly influenced by current western culture. Many students mention that the readings on "tokenism" contain important concepts. Students are struck by the limitation of roles available to a black person simply because that person is considered different. The class talks about how one can be conscious of being

*Janice Raymond, Ann Woodhull, Mary Sue Henifin, and Molly Hale were primarily responsible for conceiving and developing this course.



Nancy Lowry

BIBLIOGRAPHY AND OUTLINE FOR WOMEN AND SCIENCE SEMINAR

Each student led one week's discussion, and gave a separate presentation of her own work. The readings and discussions were organized around four questions:

- How have women scientists been treated by their colleagues?

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  Anne Sayre, *Rosalind Franklin and DNA: A Vivid View of What It Is Like to be a Gifted Woman in an Especially Male Profession.* New York: Norton, 1975.

  Nancy Henley, *Body Politics: Power, Sex and Nonverbal Communication.* New Jersey: Spectrum, 1977.

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  Betty Vetter, "Sex Discrimination in the Halls of Science." *Chemical and Engineering News,* March, 1980, 37-38.

  Rawls and Fox, "Women in Academic Chemistry Find Rise to Full Status Difficult." *Chemical and Engineering News,* Sept. 11, 1978.

- How does science look at women? How have feminists criticized these views?

  Women Look at Biology Looking at Women. Boston: Schenkman, 1979.

  "The Quirls of a Woman's Brain," Mary Roth Walsh.

  "The Politics of Right and Left: Sex Differences in Hemispheric Brain Asymmetry," Susan Leigh Star

  "Boys Will be Boys Will be Boys," Fried

  C. Benbow and J. Stanley, "Sex Differences in Mathematical Ability: Fact or Artifact?" *Science,* vol. 210 1980, pp. 1262-1264.

  G. Kolata. "Math and Sex: Are Girls Born with Less Ability?" *Science* vol. 210 1980, pp. 1234-1235.

  "The Gender Factor in Math" *Time* December 15, 1980.

  "Mathematical Sex Differences: It's in the Numbers" *Science News* vol. 118, pp. 372.

  "Are Boys Better at Math?" *NY Times* Sunday, Dec. 7, 1980 and other letters and articles on the "math gene."

- How can women do science? (life patterns, networks, friends, creating a work style)

  Working it Out. Ruddick and Daniels eds., New York: Pantheon, 1977.

  "Foreword," Adrienne Rich

  "Introduction," Ruddick and Daniels

  "Birth of the Amateur," Daniels

  "On Work," Stimpson

  "The Anomaly of a Woman in Physics," Keller

  "Learning to Work," Valian

  "'How can a little girl like you teach a great big class of men?' The Chairman said and Other Adventures of a Woman in Science," Weisstein.

  "What Counts as Work?," Sears

  "Notes from a Conversation on Art, Feminism and Work," Schapiro.

  Margaret Mead, *Blackberry Winter.* New York: Morrow, 1972.

  Mary Scott Welch, *Networking.* New York: Harcourt Brace Jovanovich, 1980, Chapters 2 and 6.

  James Levine, *Who will Raise the Children?* Philadelphia: Lippincott, 1976, Chapter 3.

- If more women did science, would its form and content be different?

  D. Haraway, "In the Beginning was the Word: The Genesis of Biological Theory." *Signs* vol. 6 no. 3, pp. 469-481.

  "Epilogue." *Women Look at Biology Looking at Women.*

  E.F. Keller, "Gender and Science." *Psychoanalysis and Conteporary Thought* vol. 1, 1978 pp. 409.

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a woman, and even a feminist, without committing "professional suicide," principally by finding support from other women, networking, and making sure that more women get into one's workplace—in other words, by not getting isolated as a token.

Another topic in the seminar that the women say is very important to them is the details of how science works: how a lab is run; who hires whom; where the money comes from; how people get it. Besides reading the book, *Rosalind Franklin and DNA,* the class read an article about an alternative form of lab structure. We also hear details from our visiting speakers of how they manage their lives and their labs; these frank first-person comments are revealing and practical.

At the last session of one seminar, the instructors asked students about anger and discouragement. Because the readings are very powerful, they were concerned that students might be turned off by this kind of knowledge. Students responded that they had been angry and discouraged, particularly at the beginning of

the course when they were reading about Rosalind-Franklin and about tokenism. The faculty had been careful to create some balance by having students read the biography of a very successful woman, Margaret Mead, to balance that of Rosalind Franklin, and reading material about networking as well as tokenism. But the students said that the main thing that more than balanced the anger and discouragement was the enthusiasm and support of the group in the class itself. As part of the seminar, each woman presented an account of what she was doing in her own work, where she had come from, and where she was going. They took this assignment seriously. One student, for example, who will be teaching science to high school students, said that some professors discouraged her from this career choice because they felt it was beneath her talents. The seminar members felt that this is very important work and that it was clear that she had high ideals and very good reasons for wanting to teach science; we cheered her on. Other students who wanted to go into medicine, scientific research, or veterinary practice were also enthusiastically supported in their ambitions, including the ambition to be first-rate practitioners.

For a number of students in this seminar, including those whose attitudes and feelings change the most, this is the first women's group that they have been in. Many of them say that they will seek out women's groups actively in the future. Because of the deep reservations that science has about women and that women have about science, this function of helping women to help each other and realize their bonds is important.

There seems to be some evidence from the Hampshire science program that women (and other heretofore disenfranchised groups) can be encouraged to enter science, succeed, and share in the community. What it takes, among other things, is a critical mass of women in teaching, a revised attitude towards what we teach and close attention to our impact on students. Science currently operates on a triage principle—the less fit (and the current community defines who is fit) will rightly fail. If we really mean to make science accessible to *all* students, we have got to pay more attention to who teaches and what and how we teach, we have to be critical of the scientific structure as it exists, and we have to be supportive of change. How the community might change if women and minorities were incorporated into it remains an open question. □

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SEX AND THE BOMB

by Lynn Stephen

On June 12, 1982, as the United Nations conducted the Special Session on Disarmament, nearly a million demonstrators in New York City called for an end to the arms race and a transfer of U.S. tax dollars from the military to human services. Within the march's organizing group, called the Special Session on Disarmament (SSDII), members debated whether these should be the only demands raised by the march. In the Boston contingent these discussions focused on feminist issues. Some women in the Boston SSDII wanted the group to develop a broader analysis of the social relations and institutions which support militarism. These women formed a feminist caucus within SSDII. I am a member of this caucus.

While respecting the need to unify the peace movement around disarmament issues, the feminist caucus felt that it was also necessary to link the issues of nuclear disarmament to other social movements. We wanted to look beyond equations which tell us that for the price of one piece of military equipment we could restore certain budget cuts. Our caucus hoped to support the broader SSDII campaign, bring the issue of militarism to the women's movement and infuse the peace movement with feminist politics.

As the caucus began to encourage dialogue in the SSDII campaign about reproductive rights and sexual liberation, we were repeatedly silenced by the larger group. For example, the leadership of the campaign, fearful of alienating a prodisarmament but antiabortion minority, wanted no mention of reproductive rights on any campaign literature. Later, 75% of the general membership voted against a proposal from the feminist caucus for a local women's peace march in which abortion would be mentioned.

For women who had participated in the peace movement of the 1960s, this experience awakened the feelings of anger and frustration which had fueled the Women's Liberation Movement. One member of the caucus commented:

> For me this experience brought back the anger and intensity of the 1960s—the kind of anger which was around in the early 1970s. Now my anger in working in SSDII comes from seeing how enmeshed people are in society... Abortion was really a pivotal issue in setting up our position. We were confronting a lot of cultural norms by confronting the notion that our involvement in the antimilitarist movement comes from being nurturers innately opposed to war.

For other caucus members, this was the first time they had seen feminism subordinated to other politics.

> I saw how quickly feminism gets pushed aside. There is a silencing of feminism even in a progressive group. Watching it happen radicalized me after a year of political inactivity.

From our experience in the SSDII campaign, we developed a solid basis for building a feminist presence in the Boston peace community. The feminist caucus continues to meet even though the larger SSDII campaign has disbanded. The ideas in this article emerged from our internal discussions. I hope my comments will raise questions about the strategies of the peace movement and provide a foundation for further discussion of the issues.

Ellen Shub

Women's demonstration at the Pentagon in 1980.

The caucus focuses on the relationship between militarism and reproductive rights, sexual liberation (gay, lesbian, and heterosexual), and the politics of the family. We believe that the New Right promotes militarism and repressive sexual politics by exploiting the concepts of security, authority, and protection. These issues, particularly "pro-family politics" are also under discussion in the left.

Lynn Stephen is a socialist-feminist engaged in anti-militarist work in the feminist and left movements. She is a graduate student in anthropology. She is also part of a 6-woman musical/political/satirical/theatrical group.

In selling its ideological package to the American public, the New Right has omitted crucial information. One of the caucus' first tasks has been to uncover that information. The issue of increased militarism is an excellent example of the significance of a topic's informational context in influencing public opinion. When the Pentagon lobbies for an increased appropriation for the Rapid Deployment Force, they tell us that it will help to stabilize Third World governments and ensure global security. They fail to mention the women in Sri Lanka who go blind producing electronic equipment for war machinery, and the women, children, and elderly citizens who are victims of U.S. military campaigns in the Third World. They never discuss the way in which this kind of military build-up increases the possibility of a nuclear war.

Playing With Fear

Antiabortion, profamily, and antisexuality politics are clearly linked to the Pentagon's defense program. In order for the state to exert authoritarian control, society must be hierarchical and uniform. The military depends upon absolute authority and obedience. Within this structure there is little room for diversity and self-determination.

While the U.S. is not a fascist state, and our constitution guarantees individual rights, we are not safe from repressive laws. Our political system allows the passage of legislation such as the military draft, which protects the interests of particular institutions and strips individuals of their civil rights. Furthermore, our government tolerates and sometimes fosters a social atmosphere in which it is acceptable to harass and even kill people of certain ethnic or cultural groups. For example, our government continues to avoid decisive actions against racist violence. From the point of view of promilitary politicians, it makes sense to push for legislation such as the Family Protection Act, which supports social relationships, values, and ideologies consistent with those of the military. Promilitary conservatives attack feminists and other opponents of the traditional social roles which support militarism.

Feminists have repeatedly pointed out that the idealized patriarchal nuclear family acts to socialize children to accept discipline and authority—particularly male authority. Gender roles fostered by this "ideal" family in which the father is the sole breadwinner prepare girls to be passive recipients and boys to be aggressive and domineering. The New Right's Family Protection Act (FPA) legislates these social roles.

The Family Protection Act would deny federal funding for schools using curricula which challenge traditional sex roles or present homosexuality as an acceptable lifestyle. Fundraising letters for the FPA cite the family as the "foundation for our society" asking readers to help fight "militant homosexuals, radical feminists, abortionists, and pornographers." Together with the Human Life Amendment (HLA), the Family Protection Act would establish the government as the guardian of sexuality, domestic relations, and as the protector of the bodies and minds of women and children. Both proposed laws impose repressive definitions of social norms and punish those who do not comply.

These pieces of legislation threaten feminists and progressive peace activists. The Human Life Amendment would give legal personhood to the fetus and convict women who have abortions of murder. Already 19 states have passed resolutions calling for a constitutional convention on the HLA. Deirdre English, a feminist activist and writer, has described the moral fervor with which antiabortion activists—often women—do their work. She interviewed a woman who stops women in front of abortion clinics and tries to dissuade them from having abortions. Calling herself a "clinical counselor," the women compared her antiabortion work to engagement in a war:

> I don't care what battlefield, CIA job or war you've been in or what type of police job...nothing touches this [abortion]... because you're getting aid from God to face this situation, the horrendous problems these people have. Some of them are in pure hell. But you can get them—and I guarantee it—you can get some of these girls to have their babies.[1]

The New Right's bible is *Wealth and Poverty* by George Gilder. Gilder offers a theoretical explanation for the link between profamily politics and the interests of U.S. capitalism and imperialism. Conservative politicians use his arguments as an economic rationale for their support of the Family Protection Act and the HLA.

Gilder thinks that the most fundamental problem with the U.S. economy is its collapsing productivity. He blames the decline in productivity upon the destruction of the nuclear family and assaults on the traditional value system in which men are providers and protectors. "The man has the gradually sinking feeling that his role as provider, the definite male activity since the primal days of the hunt and into modern life, has been largely seized from him."[2] Women, according to Gilder, are not equipped to function in the job market. When they are employed outside the home, and/or not engaged in maintaining a nuclear family, they work against capitalism and the American people. *Wealth and Poverty* presents working mothers, lesbians, women who have sex outside of marriage, economically independent women, and women on federal assistance as public enemies.

Gilder and other conservatives see the preservation of the nuclear family and its values as crucial to the survival of U.S. capitalism and by implication, the military system which guarantees its continued operation. It is easy to see why the lesbian and gay liberation and reproductive rights movements threaten them. Freeing women from the possibility of conception every time they engage in heterosexual intercourse and providing approval for gay and lesbian relationships, pulls people away from their biological roles as reproducers of the species and greatly increases their control over their bodies and lifestyles. The alternatives made possible by this separation undermine the patriarchal authority of the "ideal" nuclear family and oppose the values and social structures which support militarism—authority, hierarchy, uniformity, and the acceptance of violence.

The New Right's arguments for increased military spending, the HLA, and the Family Protection Act share a common rationale—society's increasing need for security and protection. Both militarism and profamily politics are promoted as solutions to people's deep-rooted sense that the world is no longer safe. Manipulating this fear, the New Right portrays the family as a refuge from unemployment, inflation, increases in violent crime, and dwindling public support for individual rights. Militarism

tranquilizes public unrest about a growing Third World awareness of the exploitative role of the U.S. in world economics and politics. The right uses militarism and the family to obscure the real causes of people's hardships.

Profamily Politics and the Left

The New Right has forced both the women's movement and the peace movement to connect militarism with daily life issues. Often the issues raised by the Right are so compelling that they are taken up by the Left as well. An upsetting example of this trend is an organization of antiabortion pacifists, called "Prolifers for Survival." By aligning themselves with antiabortion forces, these people are partially supporting Right to Life promilitarists like Phyllis Schlaffley. (Schlaffley's position on militarism is well summed up by her statement: "The atom bomb is a magnificent gift that was given to our country by a wise God.")[3]

A "progressive" version of the New Right's profamily platform has been taken by leftist Michael Lerner, feminist Betty Friedan, and others. These advocates of families (not exclusively nuclear families) insist that the Right should not be allowed to monopolize family issues. Lerner's organization, Friends of Families, calls for important demands such as full employment, socialized health care, and affordable community controlled childcare. But Friends of Families also idealizes the family, calling it a "haven where love and commitment take precedence over struggle."[4] Similarly, Friedan urges gay women and men to form their own families in alliance with the profamily movement, claiming that it is divisive to advocate gay and lesbian liberation.[5] The solution to living in an alienating and troublesome world for both Friedan and Lerner is to create a private, protected retreat—the family.

I would not argue with their ideal of a warm and secure home-life. Lerner and Friedan, however, never question the oppression caused by traditional family roles, especially of women. Their analysis also fails to examine the social relations and institutions outside the family which create the need for families as comforting retreats.

In response to Lerner, Feminist Barbara Ehrenreich points out that the Left's profamily platform differs critically from that of the Right, and that it is naive to assume that a conservative public will accept the "progressive" profamily ideology.

> There are people who respond to the issues that the right has encoded as profamily... opposition to abortion, to gay rights, to racial intergration, to teenage sexuality, and to morally ambiguous books like *Catcher in the Rye*. The mistake of many people on the left—not just Lerner—has been to imagine that right wing profamilyism arises from some deep and potentially anticapitalist and communitarian yearning.[6]

By equating prolife and profamily with peace and antimilitarism, the "profamily progressives" are failing to understand the fundamentals of militaristic society. An antimilitarist stance requires opposing all that reproduces militarism as an institution and a state of mind. Barbara Ehrenreich redefined the kind of defense program that the peace movement should advocate as a "domestic defense program against the evils of sexism, racism, and poverty."[7]

The connections between the oppression of women and the institution of militarism are complex. The Feminist Task Force has only begun to address the questions involved. In particular we need to do more work in exploring the role of racism as an added dimension of oppression for women of color in relation to militarism. To do this we must refocus what we define as "feminist issues" and come to terms with the differences between white women and women of color.

We will continue to raise racial and sexual politics among leftists and to push feminists to seriously take up issues of militarism. We are currently beginning to plan a large event around International Women's Day which will bring together a wide range of women's groups in an antimilitary and feminist, prowoman celebration. By declaring our opposition to the war machine and celebrating our work as women, we hope to express our feminist visions of peace.□

Ellen Shub

Women's demonstration at the Pentagon in 1981.

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INTERNATIONAL MEETING OF RADICAL SCIENCE JOURNALS

A Report by Les Levidow

For the past several years, representatives of the various "critique of science" journals have met every spring to discuss goals, strategies, and the progress of the critical science movement in various parts of the world. (See the article by Bruno Vitale on the "International Meeting of Radical Science Journals" in *Science for the People,* September/October 1981, pp. 36-37.)

In the following article, Les Levidow of the *Radical Science Journal (RSJ)* collective in England presents a report of the Easter, 1982 meetings in Italy. The report is a condensed version of an article published in the 1982 (number 12) issue of the *Radical Science Journal* pp. 90-99.

The 1982 Easter meeting was held again at the Cooperativa Marcella (near Como, northern Italy), coinciding with a large gathering of our hosts' extended family there which enhanced the festive spirit. The sunny weather was an added incentive for us to break with our past practice of filling up the afternoons (as well as the mornings) with formal sessions, which we shifted to the evenings instead; that shift gave the sessions a more relaxed mood even though they stretched until midnight. And, for me, no less important than these sessions were the informal discussions on squatters' struggles in Nijmegen and Berlin, steelworkers' riots in Brussels and political prisoners in Italy, among other themes.

Unlike the 1981 meeting, this year we had no outside institutional funding for the Milan public event preceding the weekend—a small seminar on "L'Invasione Informatica" ("The Infotech Invasion")—so we could not bring over participants from the U.S. and India. Those attending were from *RSJ, Sapere, Wechsel Wirkung, Cahiers Galilee* and *Revoluon,* all of which were already familiar with each other from past years. Nevertheless, because it appeared from initial discussions that most of our journals were facing a crisis of survival, we decided to devote the first full session to presentations from each of us on our present difficulties.

Les Levidow is a writer and active participant in the British radical science movement.

Our Journals in Crisis

Sapere ("Knowledge," Italy) is the only periodical in our circle which enjoys a mass circulation. The collective had thought that that advantage, along with advertising for the publisher's other publications, guaranteed *Sapere*'s future, based on a sharp division of responsibility between the publisher (for finance) and the editorial collective (for political content). However, the situation has become precarious in the last year, during which there have been ten issues published, while the sales have fallen from 35,000 (or from 50,000 for special monographs) to only 25,000. Some of the problems facing *Sapere* are: increasing competition from popular bourgeois science periodicals which hold a special appeal for science teachers, as well as a difficult workload for a small, low-paid staff.

In the discussion, Bruno Vitale (of *Sapere*'s external support group) pointed out that plans to relaunch the journal by obtaining an increased investment from the publisher for more advertising and paid labor, evaded the fundamental political basis of the journal's problems. He saw a political failure by the paid workers (at the Milan office) to sustain links with Sapere's formally national collective and with working class struggles around Italy, especially through the regional supplements which were once produced by local support groups. Pino de Luca replied that such participation had become more difficult to sustain over recent years as members' energies had been diverted away from *Sapere* with the launching of new periodicals—*Nuova Ecologia* ("New Ecology"), *Testi e Contesti* ("Texts and Contexts," dealing mainly with physics and math), and *Medicina Democratica* ("Democratic Medicine," now defunct).

Cahiers Galilee ("Galilee Notebooks," Belgium), recently having published innovative issues on Biotech and Infotech, is now eager to publish their next issue on Science Shops, using material from the public conference they held in early 1981. However, the journal's entire future is in doubt because of a decline in both sales and collective membership. Founded in 1967, the journal later became attached to the Centre Galilee, intended to popularize science at the university newly based at Louvain-la-Neuve in 1972. The Centre—with its bookshop, paid staff, cooperative house and wide contacts—became an essential support for the journals and held the potential to become a radical science center for all of Wallonia (the southern, French-speaking part of Belgium). However, as the university ambience has become generally less conducive to oppositional projects, the Centre has undergone a personnel change to the point where its activities are hardly related to critique of science; some members have abandoned that entirely in favor of learning computer languages or promoting ecological literature. Meanwhile the bookshop has suffered heavy losses, to the point where it has become a severe financial liability rather than a support for the journal.

The handful who remain on the journal's collective assess the problem as a failure of alternative management for the Centre and especially the bookshop even if it is unclear exactly what sort of "expertise" was needed for the experimental Centre to have succeeded.

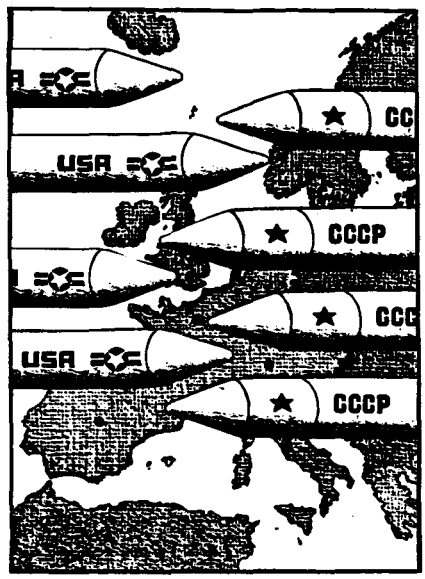
Wechsel Wirkung ("InterAction," West Germany) has sustained both its sales and its network of support groups throughout the country. The magazine's present crisis is due entirely to the bankruptcy of its "alternative" distributor, which did not go out of business sooner only because it was kept alive by *Wechsel Wirtung* (*WW*) sales, so that the magazine is now owed the equivalent of the entire cost of production for an issue. The immediate problem is to find a viable distributer capable of extending distribution to more conventional bookshops and perhaps even to newstands. Doing so depends as well upon making the content more accessible, as the magazine presently ends up printing everything submitted to it, for the sake of being able to publish frequently and regularly. There has been a debate among the support groups on whether to make *WW* more specifically a theoretical journal or, as proposed by the Berlin group, to make it more popular.

Radical Science Journal's story contains no counterpart disaster, only a financial crisis resulting from a failure to increase subscriptions and sales of back issues, which have been accumulating in storerooms because initially we sell less than 1500 copies of our 2500 print run. For the foreseeable future, *RSJ* can continue to publish only by raising personal loans. The hope for eventually breaking even lies in our decision to employ paid labor in order to publish the journal twice (instead of only once) per year and to do more ambitious publicity, perhaps linked to a new "critique of science" television series which involves some *RSJ* members and contacts.

Revoluon (Holland) invented its name as a pun on the slogan widely used by the electronics multinational Philips to connote progress through science: "Evoluon" (evolution). *Revoluon* seemed to be the only one of our journals not undergoing a crisis. Sales have been stable at around 500 copies; as in the past, the collective has been doing the distribution work themselves, including sending out parcels to 40 left bookshops in Holland. The present problem seems to be for the journal to break out of its isolation, having originally grown out of the long-departed student movement, when the journal was engaged mostly in internal critiques of science. Since then the collective has attempted to connect their articles more closely to current political projects newly interested in science as a problem, such as the science shops and the antinuclear power movement. Despite some success in promoting a critique of scientific expertise in those areas, *Revoluon* still feels generally isolated from the left, especially because the left press in Holland excludes all political debate on science and even engages in the uncritical popularization of science as "increase of knowledge."

NATO Rearmament

Our session on NATO extended the previous year's theme on how to break through the predominant notion of "defending Europe," as if Europe's broader economic/political imperialism were not itself a significant stimulus for increased war preparations. For example, in Italy the "peace movement" generally ignores the fact that Italy is the world's fourth largest exporter of arms, mostly to Third World military juntas.



Bob Gale

One result of the conference was an investigation into war-related scientific research, particularly the three types of contracts which funnel military money to Italian academics:
1) contracts from the Italian Ministry of Defense, which publishes details on the projects funded;
2) contracts from the U.S. Armed Forces, which refuse to divulge details —officially on grounds of discretion rather than military secrecy; and
3) contracts from NATO, which proudly publishes information on the academics it sponsors.

Bruno Vitale reported that a survey of the funded research revealed themes of obvious direct use to military purposes but also many other themes which probably are not directly useful. Perhaps equally important as "useful research" is the career hierarchy of prestigious research structured through military funding, which thus buys loyalty and power. For example, the notorious physicist Gell-Mann of the U.S. military's Vietnam-related Jason project,* once put this quite blatantly when he said that top scientists found Jason useful because its funding helped them to convince their prospective research students to work on particular problems.

Until now there has been a rather formalistic debate which casts the quandary of military funding in terms of distinguishing between good vs. evil researchers, pure vs. applied research, or even weapons vs. non-weapons research within military funding. In that case, some go as far as to argue that it is morally virtuous to accept such funding for nonweapons research so that the money doesn't get used to develop weapons instead! How do we get beyond such narrow debates? Rather than attack individual scientists or research students—who often naively attribute the funding to their research director's scientific prestige rather than to his military paymaster—Bruno argued for a deeper investigation into the subtle ways that military funding buys control and influence throughout science as a whole. For military funding, like industrial or state funding generally, no doubt creates some sense of moral obligation to "the firm," an obligation of long-term and possibly intangible value. Even apart from such funding, one ideological obstacle to overcome is the tendency for many radical scientists to take on responsibility for making the system work better, as in the slogan "reduce the risk of nuclear war." Such an approach can mean making some level of nuclear weaponry more acceptable, as well as exaggerating the self-importance

*"Jason" was a project funded in the mid 1960s by the U.S. Department of Defense to bring together leading American physicists to develop new weapons and strategies for the Vietnam war.

of scientists themselves, rather than supporting attempts to weaken the entire military system.

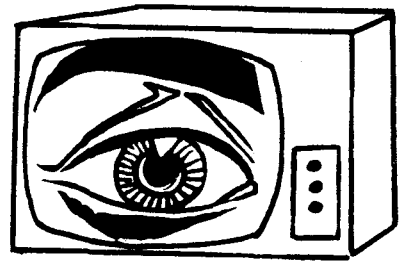
After discussing the Italian case, we heard brief comments on other countries, though not directly around critique of science. In Holland, the only NATO member not yet agreeing to accept the new nuclear weapons, the disarmament movement gained much legitimation from the unusual decision by the Church Peace Council in 1977 to make that country take the lead in nuclear disarmament. In Germany, it is particularly easy to rally opposition to nuclear weapons because they are widely seen as an American import and impostion, though there is a serious problem in the nationalistic aspect of that opposition (anti weapons on grounds that Germany lacks control over such weapons). In Britain, in the way it discusses "alternative defense," the disarmament movement steers clear of any hint that the British state is the main enemy of the population; the movement's nationalist basis can be seen for example in the nervous (or nonexistent) reaction to *Towards a Citizens' Militia,* an anarchist manual which takes defense seriously by showing us how to defend ourselves militarily against the British state. For defining themes for radical science critique suitable for a European-wide coordination, it was suggested that we take up the fallacy of a limited "battlefield" nuclear exchange and the fallacy of "medical care" following a nuclear attack; yet the disarmament movements have already debunked those fallacies.

The session on NATO concluded with my presentation on the emerging role of Ireland in NATO's rearmament. Some aspects of NATO's plans for Ireland—such as radar tracking stations—reflect concerns for "Western defense" from the Warsaw Pact. Other aspects, such as bases for the U.S. Rapid Deployment Force (RDF), especially in the 26 Counties (the Irish Free State)—point to the importance of NATO rearmament for the imperialist domination of Third World countries. The usefulness of a credible first-strike capability for blackmailing the USSR with respect to Third World liberation movements (as the U.S. tried to do over Vietnam in 1972), considered along with the RDF, further suggest that the newest rearmament is geared to maintain the U.S. hegemony (over Europe) within their joint imperialist domination.

Lastly, I tried to draw out some implications for the predominantly political approach of European disarmament movements (even if strangely calling themselves "apolitical"). Insofar as they entail calls to defend Europe or "the nation" by non nuclear means, they contain an ambiguity towards European imperialism. In the British case the disarmament movement studiously avoids confronting the Irish War or recognizing its role in NATO's future in Europe. Indeed, it could be argued that Center for Nuclear Disarmament's (CND) approach in fact has nothing necessarily to do with peace, since its overall politics are perfectly compatible with conventional rearmament. Just before our annual meeting, that compatibility suddenly became obvious when the venerated "peacemonger" Michael Foot (along with the reactionary Tory Francis Pym) made rabidly nationalist calls for the Thatcher government to invade the Falkland Islands and strengthen the British Navy. Given this political context, it is not good enough for a nuclear disarmament movement simply to cite NATO's apparently irrational "overkill" capacity, to debunk claims about the USSR's weapons superiority or about Europe's survival after a "limited" nuclear war. If the movement cannot demystify the global politics underlying the new weaponry, especially the imperialist basis for NATO's very existence, then it ultimately will not succeed in stopping even non nuclear imperialist wars, much less the nuclear rearmament itself.

Information Technology

Our session on Infotech began with presentations on developments in European countries. In Germany the Post Office is intalling glass fiber cables into houses to carry the Viewdata system and possibly the existing television stations as well. This installation gets paid for involuntarily out of rent increases supposedly warranted by this "home improvement." Also, telephone systems in Germany and Italy are linked to computers which automatically record all details of telephone calls. Although all these developments are explicable in terms of "efficiency" and profitability, they have implications for state surveillance as well.



Video Power/cpf

So far it is mainly the professional-managerial stratum which have been paying for installation of a home terminal. But a wider use will inevitably come with reduced prices and with the habituation to these technologies already underway at the workplace. And even in capitalist terms this does not necessarily mean increased "freedom of choice," because the glass fiber cable is not supplementing but replacing the antennae, as telephone and televison sets become integrated with a larger information and computer system.

Our discussion moved on to how oppositional projects could either use or sabotage these new technologies. In Germany the cable system has an "open channel" supposedly available for noncommercial broadcasting but often applicants find themselves turned down, with legalistic excuses being used as a pretext for political censorship. As a result, oppositional videos are shown mainly in alternative cinemas and clubs or in the streets, using mobile video screens, even if the official television networks sometimes ask to use short clips from the oppositional films. In Belgium where 90% of all homes already have cables installed, some oppositional groups have benefitted by being courted by the state television monopolies as allies against private commercial firms.

A People's Science

Our final thematic session took off from the collective recollection that most of us had originally got involved in "radical science" with some notion of creating a people's science capable of displacing the established science. Although our original notions of a people's science—conceptualized in terms of class control, accessibility, popularization, etc.—may in retrospect seem naive or reformist, the problem still remains of how some version of science could become truly oppositional.

To introduce this session, we accepted an offer from *Sapere* to describe the experience of the research group at the Castellanza branch of the Italian multi-national Montedison (as reported in their February-March 1982 issue). In early 1981 Montedison shut down the entire research group for political reasons and is now offering them redundancy payments to get rid of these researchers forever. The political reasons can be seen from the group's role in compiling a comprehensive list of noxious chemicals with the commercial brand names translated into their component parts, so that workers could use the list as a political weapon. After the Seveso accident,* the research group worked politically with the plant's operatives to reconstruct a chronology of events; in a similar spirit they used the Montedison laboratories to help enforce and strengthen the contractual agreements on the maximum permissible level of noxious substances.

Although *Sapere* contains fascinating details of Montedison's history as a public and private firm, our main interest lay in drawing out aspects of the research group's practice which might point to a different approach to science. Particularly significant seemed the involvement of all levels of the workforce as protagonists rather than their being relegated to passive objects of study, e.g. as mere victims of health and safety hazards. The latter situation is what tends to happen when people bring their problems to science shops, which accepts them only if presented in a "scientific" (technical) form and not in an overtly social or political form. In the end, the "customer" is presented with a technical solution to the original problem, so that a political conflict still gets represented as a conflict of opposed scientific expertises. Indeed, perhaps the mystification is perpetuated by the very notion of "science shops," as if they were simply taking ready-made facts off a shelf.

A people's science would have to begin by acknowledging the fully social dimension of any apparently "scientific" problem, that is, how capitalist social relations construct not only science but nature itself through particular choices of questions asked. It is a matter of conceptualizing and constituting nature in an entirely different way, to the point where such an oppositional practice of knowledge might be hardly at all recognizable as "science." For, historically, science became distinguished precisely by its claim to be a-social knowledge, a technical knowledge abstracted from any particular social relations. The real political challenge for radical science, then, is to deal with political conflicts by posing questions which do not fit into the accepted definition of a purely scientific problem, so that we do not end up simply as "alternative experts."

Through further informal discussion, some of us took up the more fundamental question of why is science important? To that question there are very different—indeed, counterposed—answers underlying (at least implicitly) the various political practices which are all labeled "radical science," among them: Science is important as mass political control, precisely because it can pose itself as a separate specialized body of knowledge, which radical science must persistently convert back into constituent social relations, so as to make those relations more amenable to challenge. Science is important because capitalist science is biased (e.g. geared to the profit motive instead of use values) or even mendacious or unscientific, so that radical scientists must define the real truth and people's need.

At our final session we briefly discussed the problem of how to connect our critique of biotechnology to any agitational practice. Previous radical approaches have limited themselves largely either to "doomsday warnings" about runaway bugs (and other horrors) or to ethical objections to creating new life. Those critical approaches may have seemed intuitively more appealing than an anti-restructuring approach, yet they have had virtually no oppositional effect. That failure came partly because people see biotechnology as bringing them real benefits as consumers, even if it also brings massive profits to private capital (indirectly subsidized out of workers' taxes) and destroys the livelihood of Third World workers in the extractive industries displaced by its biochemical industrial processes. How do we get beyond the failed approaches?

1983 in Nijmegen

The group accepted *Revoluon*'s offer to host the 1983 international meeting in Nijmegen, with the main themes to be health and safety and biotechnology, preceded by a public meeting (probably March 31st) tentatively entitled "Science For Political Action." Although one motive for this decision was to involve many of the science shops in Holland, we wanted to keep the theme broader, especially because their different political approaches (See *Radical Science Journal* Number 10, p. 98) vary so greatly that other relevant projects would have more in common with some science shops than the shops as a whole would have in common with each other. For the conference the *Revoluon* collective will investigate possible resources in Nijmegen, prepare an advance discussion document and solicit presentations from groups outside our journals, including their comments on our journals; any group interested in taking part should contact them at the following address: Tijdschrift Over Technologie, Wetenschap en Kapitaal, Postbus 1328, 6501 BH Nijmegen, Holland.□

*In 1976 a potentially dangerous release of Dioxin occured in the Italian town of Seveso. For complete details of the accident see *SftP*, vol.9 no. 6, 1977, pp 8-16.

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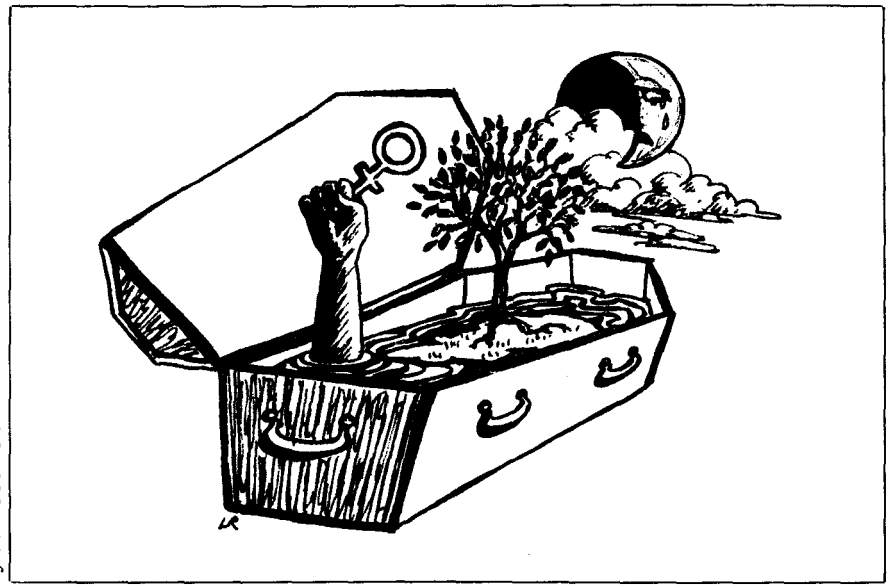
book review

by Rita Arditti

The Death of Nature: Women, Ecology and the Scientific Revolution

by Carolyn Merchant, Harper and Row, New York, 1980.



Lynn Roberson

In *The Death of Nature* Carolyn Merchant, a historian of science at the University of California, Berkeley, examines the Scientific Revolution of the sixteenth and seventeenth centuries and the transformation it caused in societal conceptions of women and nature. The emergence of capitalism and modern science brought about vast changes in the relationship between human beings and nature. Merchant documents these changes and shows us how women, in particular, were affected by them.

According to Merchant, before the Scientific Revolution nature was seen as either a nurturing mother or a wild force that manifested its strength in storms, droughts, and earthquakes. Holistic thinking predominated; the self, society, and the cosmos were thought to be bound together like parts of a living organism. The theory of *organicism* prevailed—the cosmos was seen as a structural and functional unity. However, when commercialism and industrialization began altering the face of the earth through mining, drainage, and deforestation, a new vision of the world began to emerge. In this vision, incompatible with the former holistic philosophy, self, society, and the cosmos were composed of interchangeable atomistic parts that could be repaired or replaced. A new theory called *mechanism* supported the exploitation of natural resources; the machine became the symbol of this new world view. The image of nature as nurturing began to fade and a feeling emerged that women, seen as the human manifestation of a wild nature, needed to be controlled. The result was the persecution and burning of witches (85% of those tried for witchcraft were women). Women were forced out of trades such as baking, butchery, and brewing, where many of them had been strong leaders. Midwives gave way to male doctors and the use of forceps in birthing.

According to Merchant, Francis Bacon, (who presented the concept of the modern research institute in his book *The New Atlantis*) introduced a new ethic sanctioning the exploitation of nature and reducing it to a resource for economic production. The image of the scientist was a male one: he was portrayed as a sort of priest warrior who would "penetrate" nature's hidden secrets, gather "hard" facts and solve problems with the "thrust of his argument." Sexual and sexist imagery permeated the new scientific view of the world.

Thanks to the hegemony of the mechanistic view of the world, scientists have since been able to present their work as "value-free" and "objective." Because mechanism has eliminated from science the concepts of purpose, harmony, and quality, it has helped to hide the relationship between scientific ideas and human experience. As a result, common sense, intuition, and a concern for values are considered nonscientific, subjective experiences. The more science has been reduced to a mathematical model the more it has gained legitimacy.

Uncovering Women's History

Merchant recovers an important piece of women's history by drawing attention to the work of Anne Conway, a Quaker philosopher who reacted to the atomistic view of the world by developing her "vitalist" philosophy, which affirmed the life of

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all things and the lack of distinction between matter and spirit. As still happens to many women, Anne Conway's work was attributed to a different philosopher because her name was withheld from the title page of the original Latin edition of her book, a custom then imposed on female authors. We need to remember these practices when we wonder why so few women appear in histories of science.

Merchant also gives us a vivid description of Margaret Cavendish, "a feminist who betwen 1653 and 1671 wrote some 14 scientific books about atoms, matter and motion, butterflies, fleas, magnifying glasses, distant worlds, and infinity." (p. 270)

The book's 24 illustrations, largely from sixteenth and seventeenth century texts, heighten Merchant's arguments. One is a drawing of Pascal's adding machine, developed in 1642, which was a model for Hobbes' concept of the human brain and a precursor of the modern computer. Another, taken from the title page of a book titled *Hic-Mulier* or the *Man-Woman* that was published in England in 1620, shows a women in a barber's chair having her hair cut short while her companion outfits herself in a man's plumed hat. In 1620 women were rebelling against orders from King James that prevented females from looking and dressing in masculine fashion. King James, who was Bacon's mentor, actively supported laws against witchcraft.

Unlike other historians of science, Merchant links her work to the present ecological crisis:

> Three Mile Island is a recent symbol of the earth's sickness caused by radioactive wastes, pesticides, plastics, photochemical smog, and fluorocarbons. The pollution "of her purest streams" has been supported since the Scientific Revolution by an ideology of "power over nature," an ontology of interchangeable atomic and human parts, and a methodology of "penetration" into her innermost secrets. The sick earth, "yea dead, yea purified," can probably in the long run be restored to health only by a reversal of mainstream values and a revolution in economic priorities. In this sense, the world must once again be turned upside down. (p. 295)

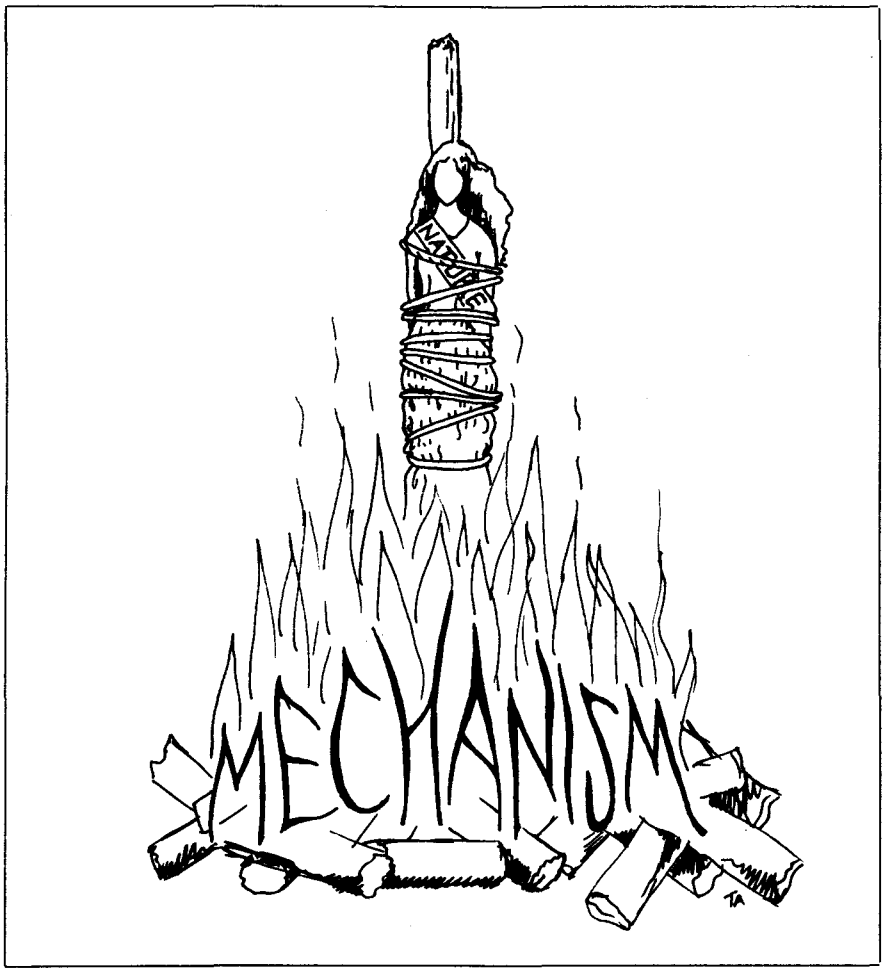
Some of us, of course, are attempting to do just that. We have already begun to question the myth of the neutrality of science. Science for the People and other groups are challenging the "objectivity" of science. Women's groups and ecology groups are again bringing forward a philosophy of holism. The slogans "The personal is political" and "Love your mother (Earth)" speak of interconnection and nurturance.

A Sense of Hope

The Death of Nature has minor flaws: Merchant tends to use difficult language and to restate her important ideas too many times. As a result this book is not easy to read and is sometimes too abstract; better editing would have made it clearer and more accessible. Also, the treatment of women's position in society *before* the Scientific Revolution could have been developed further. Merchant seems to imply that sexism is incompatible with naturalism, a view which leaves unexplained the dominant misogyny of the Middle Ages.

Nonetheless, *The Death of Nature* should be required reading for the members of the scientific establishment (which is overwhelmingly white and male) who still believe in the neutrality of science and consider mechanism the only acceptable approach to scientific inquiry.

For feminists, Science for the People members, and ecology activists, this book offers a historical context for our present struggles and a reinforcement of the idea that self and nature are interdependent, an idea that we have lost and should regain. *The Death of Nature* offers a sense of continuity and hope.□



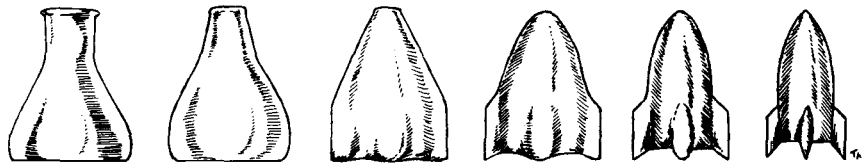
Tana Acton

book review

by Joseph Alper

Science and Liberation

edited by Rita Arditti, Pat Brennan, and Steve Cavrak, South End Press, Boston, 1980.



Tana Acton

In recent years, people have become increasingly concerned about the problems posed by nuclear power and weapons, toxic wastes, and polluted air and water. Critics of U.S. science policy have written many books and articles discussing the harmful effects of science. The analysis in most of these works has been based on what has been called the "use-abuse" model. According to this model, science itself is value-free, impersonal, and autonomous. Scientific facts are "out there" waiting to be discovered. Even personal accounts of scientific discoveries, like Watson's *The Double Helix,* which focus on the process of scientific discovery, give the impression that the search for scientific truth is little different from the search for buried treasure. Our knowledge of nuclear physics, for example, is usually thought of as an inevitable consequence of the activity of scientists. Yet the application of this knowledge—either in medicine to cure people or in weapons to kill them—depends on factors extrinsic to science. In this case, the extrinsic factors include, but are not limited to, the relative strengths of the military and medical research lobbies and the political and social orientation of the president and congress.

Science and Liberation, a collection of essays edited by Rita Arditti, Pat Brennan, and Steve Cavrak, is one of the relatively few books about science which goes beyond the use-abuse model. The editors recognize that science must be regarded as an institution of society which cannot be understood in isolation from the culture in which it arises. Economic, social, and political factors influence not only the uses of science but also the activities of the people who work in science and even the nature and content of the scientific theories themselves.

The first two parts of *Science and Liberation,* entitled "The Myth of Scientific Neutrality" and "Science and Social Control," show how science itself is directed to serve the interests of the federal government and of large corporations. This control over the direction of science is exerted by means of the funding process. Modern scientific research is a very expensive undertaking which, in general, cannot be carried out without grants or contracts. Today, in the United States, the vast majority of scientific research is funded either directly or indirectly by the government or business.

In general, those areas believed to have the greatest potential for profitable or ideological applications are the areas funded—often at the expense of others. This selection process occurs in even the most abstract and theoretical areas of physics and mathematics. An analysis of funding policy can explain why scientists know so much about organic polymers and relatively little about the role of trace elements in human physiology. The unequal growth of these fields reflects the different interests of the manufacture of plastics on the one hand, and improvements in human nutrition, on the other.

Even within a given research field, the choice of the problem considered by the researcher and the manner in which the problem is investigated often directs the inquiry toward a solution that reflects the preconceptions and biases of the researcher. For example, Arthur Jensen concerned himself with questions about the heritability of IQ and in particular, with the question of how much of the difference between the IQ scores of blacks and whites can be attributed to genetics. He and others like him show little interest in studying how black children can be taught to improve their academic performances regardless of whether their problems are caused by heredity, the environment, or some interaction between the two. This question was not studied because the very purpose of Jensen's work was to show that compensatory educational programs fail because of the inherent inferiority of blacks and consequently that there were legitimate reasons for discontinuing their funding.

Scientific studies like Jensen's, which justify the social policy advocated by some dominant group of society, constitute one of the major directions of contemporary scientific research. Several essays in *Science and Liberation* describe studies in such areas as the genetics of intelligence, the genetic basis of social behavior, the biological basis for the differences between men and women, and the use of computers for social control in South Africa. All of this research is used to explain and justify discriminatory policies which result in drastically unequal distributions of power and wealth. The chief purpose of these theories is not to expand scientific knowledge, but rather to provide an "objective" means of legitimizing the status quo. As the essays in *Science and Liberation* show, the science in all these studies is faulty, but more importantly, the research itself is based on ideological and not scientific considerations.

Another major direction of scientific activity is war-related research. As the editors note in their introduction, over

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one-half of the nation's scientific budget is devoted to defense and to defense-related science. The Lawrence Livermore and Los Alamos Scientific Laboratories are owned and financed by the U.S. Department of Energy and administered by the University of California; it receives funds from both federal and state governments. A group that is working to change the direction of University-based research, the University of California Nuclear Weapons Labs Conversion Project, describes the operation of the laboratories in their essay. Contrary to the publicity about energy projects carried out by these laboratories involving such sources as solar and geothermal energy, the Project has estimated that at least 70% of the labs' work is weapons-related. In particular, one-half of the total work consists of direct nuclear weapons research. The labs have come to depend on the nuclear arms race for their survival and have become important lobbyists for the continued development of new weapons systems, arguing that their work constitutes a "public service."

Scientific research is also directed toward advances which will increase profits. In his essay "Corporate Roots of American Science," David Noble describes how large corporations gained control over whole sections of American science—in particular, the fields of chemistry and electrical engineering. If we discount the science which is funded primarily for profit, for its military potential, or for its use in justifying social policy, we find that only a small fraction of scientific research is pursued for the sake of pure knowledge. Most pure science is in fact a byproduct of the scientific agenda of the funders of science.

The third part of *Science and Liberation* treats science from the point of view of scientific workers. The usual conception of the scientist as an independent free-spirit who chooses a problem of interest, guesses a solution, and devises an experiment to test the proposed solution applies to only a remarkably small number of scientific workers. Most people working in science are similar to factory or shop employees. The same sorts of social relations seen in all other institutions of society apply in scientific laboratories as well. Laboratories are extremely hierarchical with a chain of command leading from chief scientists to associate scientists to research associates to technicians to service workers. Just as in other institutions, the percentage of women and minorities in the higher positions is small but increases dramatically in the lower positions in the hierarchy. Many accounts of scientific research from the point of view of the chief scientist are available and are widely known. *Science and Liberation* contains essays by junior scientists, technicians, and women who describe working in a laboratory from their point of view. After reading this section it is clear how scientific research is actually structured and carried out.

The final section of *Science and Liberation* consists of an attempt to transcend the gloomy analysis presented in the first three sections. How can science be liberated so that scientific results can be of benefit of people and so that scientific work can become a rewarding experience for all its practitioners? Two black scientists in the essay, "Science, Technology and Black Liberation" propose the formation of a Union of Black Scientists and Technicians, designed to recruit more blacks into science, to struggle against racist science, to become active in science curriculum development, and to encourage work on projects such as solar energy which would provide the basis for a people's science. Other essays in this section deal with alternatives to present methods of teaching science, with alternative structures for scientific laboratories, and with models for a people's science.

A paragraph which perhaps best summarizes the message of the entire book appears in an article by one of the editors, Rita Arditti, on "Feminism and Science":

> The task that seems of primary importance—for women and men—is to convert science from what it is today, a social institution with a conservative function and a defensive stand, into a liberating and healthy activity . . . When science fulfills its potential and becomes a tool for human liberation, we will not have to worry about women "fitting" into it because we will probably be at the forefront of that "new" science.

Tana Acton

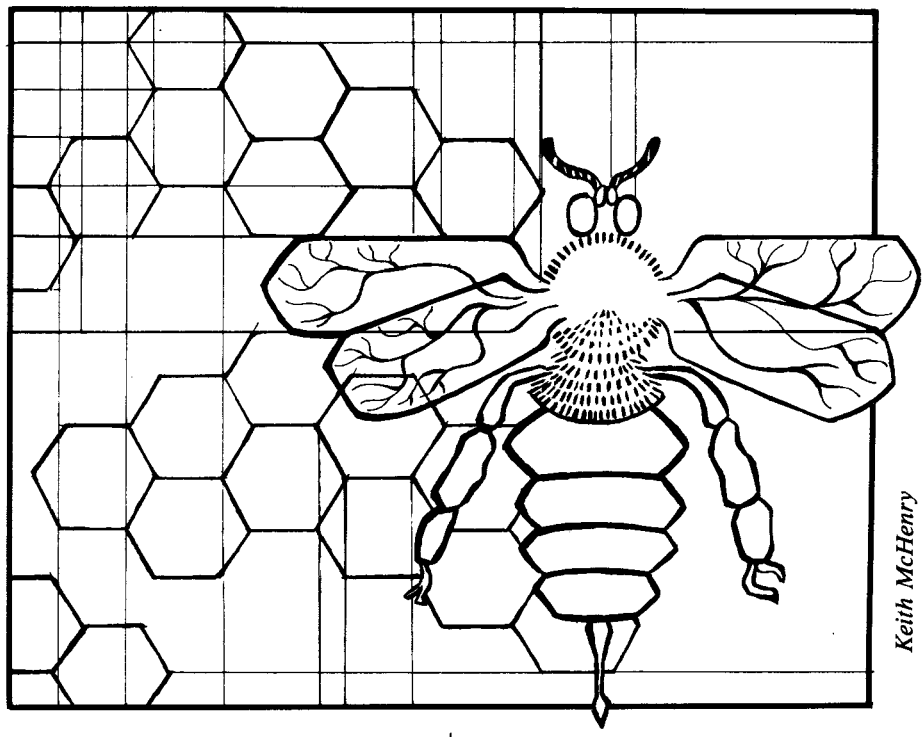
As in any collection, the 25 or so essays in this book range in quality and timeliness. However, they present a coherent picture of the institution of science and its role in our society. *Science and Liberation* is unique in its portrayal of science as it is actually practiced and used. It should be read by anyone concerned with understanding the important role of science in our society.

book review

by Alan Epstein and Connie Phillips

Architect or Bee? The Human/Technology Relationship

by Mike Cooley, South End Press, Boston, 1980.



Keith McHenry

New technologies such as computers, robots, and microprocessor controlled production machines, have had many positive effects on our lives. For example, the task of welding an automobile body can be performed safely by a robot arm, and the word processor allows editing of large amounts of text in a fraction of time with considerable savings in effort. New technology has the potential to make our lives safer and easier.

At the same time, society pays a high price for these benefits. Job loss, deskilling, and the alienation of many workers is a result of the introduction of new technological processes and machines in the workplace. In addition, some types of automation increase the risk of injury and health problems for workers. One frequently hears of layoffs of auto workers and newspaper typesetters, of alienation of assembly line workers, and of the dangers to secretaries posed by Video Display Terminals (VDTs). Less commonly spoken of, but equally important, are the negative effects of technology on professional and skilled workers.

In *Architect or Bee?*, Mike Cooley examines both the positive and negative aspects of new technology, and the effect they may have on the professional worker. For example, computer aided design (CAD) and computer aided manufacturing (CAM) tools have forced faster output rates and limited creativity through the routinization of the work, thereby deskilling designers. With CAD machines, designers are *able* to work faster, paying less attention to some of the details, and consequently are *expected* to work faster, often by using a limited set of functions programmed into the machine. The skilled workers lose more control over their working situations, and ultimately experience loss of creative input and skills.

Deskilling fits very well into management's idea of ideal labor relations. Cooley exposes some assumptions of the productions process theorists, such as Frederick W. Taylor and Robert Boguslaw, who saw humans as merely another form of production input. Boguslaw wanted to quantify and control workers' actions in order to compare them to other production inputs or processes. For Boguslaw, the main problem with using humans as workers was their ability to "design their own circuitry"—that is, to think.

Taylor envisioned breaking down each labor task into its smallest possible elements of motion and assigning one worker to execute each of these repetitious elements separately. This system allowed for interchangeable workers who would need little training to perform their task. Many managers today employ similar methods. Cooley describes one method developed by engineers in the British auto industry whereby allotted times for certain "necessary" activities have been written into the union contract:

Trips to the lavatory	1.62 minutes
For fatigue	1.3 minutes
Sitting down after standing too long	65 seconds
For monotony	32 seconds

Alan Epstein is a computer programmer who is currently working on a robot which will appear in a Broadway production. He is also active in the labor task force of New Jewish Agenda, a national organization of progressive Jews.

Connie Phillips is a long standing member of Science for the People. She is currently teaching college science and writing curricula on nuclear war.

Cooley also exposes an irony of technological advance. As Artificial Intelligence (mechanical simulation of thinking) research proliferates, jobs are downgraded, requiring less and less intellect to perform them. It appears that we are being set up for mental as well as physical replacement by these machines. Cooley raises some interesting questions in his analysis: How will a truly progressive society deal with technology? Can the problems of scientific development and technological change, which are primarily due to the nature of our class-divided society, be solved solely by changing the economic base of that society? Cooley's solution calls for workers to own the objects of their labor.

Also evident is Cooley's real compassion for human beings, and his respect for the intelligence and creativity we all possess. People have the potential to come up with good ideas when given the chance; whether these ideas are expressed abstractly or tangibly is not important.

This philosophy led Cooley and others to initiate the Lucas Aerospace Combine, ostensibly to stop the loss of jobs. Lucas Aerospace, a division of multinational Lucas Industries, is Europe's largest aircraft manufacturer. In the early 1970s, Lucas Aerospace in Britain was losing money, and began laying off workers. To prevent the layoffs, both blue-collar and white-collar unions at Lucas formed a coalition, the "Combine," to develop ideas for alternative, socially useful products that Lucas could produce. Over 150 new products were proposed, among them: a portable life support system for heart attack victims, a battery driven car, and an efficient combined electricity and heat system.

The Lucas management rejected the plan, but the Combine continued to work together. With the creation of the Centre for Alternative Industrial and Technological Systems (CAITS), at North East London Polytechnic, and with assistance from some of the left-wing Labor Members of Parliament, their plans proliferated. More recently Lucas has allowed negotiations on some of the proposals.

The Lucas plan is neither a failure nor a success, but internationally it is being studied and sometimes copied by other trade unions. Swedish and Australian trade unions have publicized the ideas, and the International Association of Machinists in the U.S. has set up groups similar to the Lucas Combine Committee. The Machinists have also established an Office for New Technology and Products Marketing, which seeks improved management-worker relationships and production processes.

Although highly readable, *Architect or Bee?* has a few flaws. The book is a compilation of papers and talks given by Cooley over an eight year period, and as a result, some of the book tends to be redundant. Furthermore, some of the examples given are overly technical and not clearly defined. For instance a discussion of the problems of micrographics systems entails obscure data related to "dioptres of accommodation." It is not clear what a micrographics system is, and while the term "dioptre" might be comprehensive to an opthalmologist, it is not normally part of the layperson's vocabulary. Unless readers can ignore these undefined terms, they may become too intimidated to read further.

Architect or Bee? is, however, a valuable work. Cooley's analysis is very helpful in understanding the economic and political considerations of new technolpgy and the future of workers, both blue-collar and professional. □

Academia Incorporated
(Continued from page 11)

gers of Kilgore's "dictatorial peacetime scientific general staff." Such strident calls for scientific liberty appeared compelling but, as these men well knew, science had never been truly independent. Whether directed toward industrial or military ends—as in Jewett's Bell Laboratories or Conant's Manhattan Project—science had *always* followed the course set for it by political, industrial, or military priorities, either through general patterns of funding or detailed management supervision. The issue here was *not* control of science, but control by whom—by the people, through their democratic processes of government, or by the self-chosen elite of the military-industrial-education complex.

Bush, whose own technical career centered upon the solution of problems for the utilities and the emergent electronics industries, assailed Kilgore's emphasis upon the practical, socially useful ends of scientific activity. Posing once again as a champion of "pure science," he derided the Kilgore agency as a "gadgeteer's paradise." He also strongly opposed Kilgore's insistence upon lay control of science, arguing that this would violate the standard of excellence which supposedly marked scientists' control over science.

In response to Kilgore's challenge, Bush and his colleagues formulated a counter-proposal for a National Research Foundation (later called a National Science Foundation). Bush proposed the establishment of a board-run agency, buffered from presidential accountability and most likely to serve as a tool of the academic scientific community which Bush represented. He also argued for a continuation of the OSRD patent policy. This policy gave the director of the agency discretion in awarding patent ownership to contractors. Central to the Bush plan was professional rather than lay control over science. Bush outlined his plan in the famous report "Science, the Endless Frontier." Not everyone was convinced. According to science writer Daniel Greenberg, the plan "set forth an administrative formula that, in effect, constituted a design for support without control, for bestowing upon science a unique and privileged place in the public process—in sum, for science governed by scientists and paid for by the public." Bush acknowledged that he was asking for unusual privileges for his constituents but insisted that good science was an essential priority for a strong and prosperous society.

James R. Newman, top staff official of the War Mobilization and Reconversion Office argued that the Bush plan "did not fulfill the broad, democratic purpose which a Federal agency should accomplish." Oregon Senator Wayne Morse insisted that the Bush scheme was being "fostered by monopolistic interests" and was opposed by "a great many educators and scientists associated with state-supported educational institutions." Other outspoken opponents of the Bush proposal included White House aide Donald Kingsley and Clarence Dykstra, chancellor of the University of California at Los Angeles (UCLA).

Many politicians wearied of what they viewed as the self-righteous arrogance of the scientific elite. E. Maury Maverick, Director of the Smaller War Plants Corporation, testified at a Senate hearing on the postwar science foundation legislation. "I do not wish to impugn even remotely the patriotism of the great scientists who have already appeared before you," Maverick replied to Isaiah Bowman, well-known scientist and President of Johns Hopkins University. "But I suggest that all scientists remember that there are other patriots in the world beside themselves and it would be a good idea to develop some social consciousness . . . The political character of our Government guarantees democracy and freedom, in which the people, through their government, decide what they want. A scientist, because he receives $50,000 a year working for a monopoly, or a big business, must remember that this does not necessarily make him pure except that he may be a pure scientist."

The issue here was not control of science, but control by whom—by the people, through their democratic processes of government, or by the self-chosen elite of the military-industrial-education complex.

The Birth of the National Science Foundation

The two bills for a postwar science foundation—Bush's and Kilgore's—were debated in Congress for several years after the war. During this time a Republican majority came to dominate both houses. The Kilgore version, endorsed by the Democratic administration, encountered stiff opposition on Capitol Hill. The Bush version passed through Congress in 1947, only to be vetoed by President Truman. Truman's veto echoed Kilgore's concerns. Truman commented: "This bill contains provisions which represent such a marked depar-

ture from sound principles for the administration of public affairs that I cannot give it my approval." He concluded that the proposed National Science Foundation "would be divorced from control by the people to such an extent that [it] implies a distinct lack of faith in democratic processes. I cannot agree that our traditional democratic form of government is incapable of properly administering a program for encouraging scientific research and education."

After the veto, the National Science Foundation (NSF) bill languished in Congress while the ONR continued to grant university researchers financial support. Finally, early in 1950, a compromise bill, which was in reality a triumph for the Bush approach, was passed by Congress. It was sustained by Truman, who was by then engulfed by the Cold War and the exigencies of "national security" once more. The 1950 bill conceded to Kilgore and Truman a presidentially-appointed director—to be advised by an exclusive board of private scientists. The first director, Alan Waterman, who was to head the NSF for a decade, had been chief scientist at the ONR. He was committed to continuing the patterns established during the war—science run by the scientist at public expense. "It is clearly the view of the members of the National Science Board," the Fourth Annual NSF Report declared, "that neither the NSF nor any other agency of the government should attempt to direct the course of scientific development and that such an attempt would fail. Cultivation, not control, is the appropriate and feasible process here."

The ONR and the NSF institutionalized the patterns of research funding and administration that had been created during the war. Henceforth, science would be "cultivated" at the taxpayer's expense but with little public accountability. Taxpayers now had to be content that the advancement of science by scientists would inevitably meet *their* interests as well. In the Department of Defense and the NSF, and later in the National Aeronautics and Space Administration (NASA) and the National Institutes of Health, this quasi-religious view of science came to predominate. Academic scientists and administrators were granted unusual license to conduct their government-supported affairs with little public oversight, with little regard for the larger social purposes of science, and with little more than polite contempt for the public interest.

The interests of scientists are not all scientific. In the postwar electronics boom of the 1950s and 1960s, many academic scientists routinely became corporate consultants, directors, officers in private companies, and even "spin-off" entrepreneurs in their own right. University faculty members thus divided their time between being stewards of publicly funded research centers and agents of commercial enterprise.[3] Predictably, they became the focus of renewed criticism, but this time, the criticism lacked the coherence that it had once had and the critics lacked political power.

Doing Business with Academia

Some recent major contracts between corporations and universities and their affiliate institutions

Company	University	Value of Contract	Year	Description
Celanese	Yale	$1.1 million over 3 years	1982	Basic research on enzymes
Monsanto	Washington University	At least $23.5 million over 5 years	1982	Basic and product-oriented research on proteins and peptides
Engenics*	Stanford, MIT, California	$2.4 million over 4 years	1981	Chemical engineering and biotechnology research
DuPont	Harvard Medical School	$6 million over 5 years	1981	Fundamental genetic research
Hoechst	Mass. General Hospital (Harvard Med. School affiliate)	At least $70 million over 10 years	1980	Creation of department of molecular biology to conduct biotechnology research
Exxon	MIT	$7 million to $8 million over 10 years	1979	Study of more efficient and non-polluting combustion methods

*Engenics is a joint venture of Bendix, General Foods, Koppes, Mead, Noranda Mines, and Elf Aquitaine.

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First Time Tragedy, Second Time Farce

More recently the connection between academia and industry has been reinforced. And, once again, criticism of the commercial connections and dealings of university-based scientists has reemerged. But this time, the critics may prove to be more effective. The California Rural Legal Assistance agency (CRLA), for example, has sued the University of California for using public funds to develop farm mechanization technology. This agricultural equipment serves the interests only of

large growers, at the expense of small growers and farmworkers. The CRLA charges that this research was directed not by public-spirited scientists but by collaboration between university researchers and big agribusiness firms, with which the university is intimately linked. More recently, the CRLA has compiled extensive documentation of conflict of interest throughout the University of California system and has called for the State of California to apply state conflict-of-interest regulations to university personnel.

On the national level, Congressional hearings have been held by Congressperson Albert Gore to look into the new industrial invasion of the universities. The hearings will assess the undue leverage over public resources now being acquired by private firms. Throughout the country, critics are beginning to call for government measures to safeguard the public interest, and to insure that the public gets a fair return, in terms of jobs, revenues or well-being, from the firms which are permitted to exploit them. Most importantly, critics are beginning once again to envision a democratic mechanism that would oversee university-based research activities in order to render science and technology compatible with democracy and the public interest.

Critics are beginning once again to envision a democratic mechanism that would oversee university-based research activities in order to render science and technology compatible with democracy and the public interest.

Academic scientists with corporate connections are trying to protect private prerogatives by reviving the romantic contest between the forces of freedom and progress (science and universities) against the forces of tyranny and reaction (government). Poised as champions of untrammeled inquiry, they are boldly defending university scientists from government "interference" while diverting attention from their arrangements with private firms which readily permit similar "interference." This corporate scientific campaign has recently taken shape in a new committee of the National Academy of Science. This committee is charged with the task of promoting cooperation in science and guarding against any and all restrictions on the flow of scientific information. The committee is composed equally of university administrators and executives of multinational corporations.

Thus, as in the early postwar years, the academic scientists have joined forces with their industrial counterparts to foster private interests in the name of science. They are not unaware of the history they are trying to recreate. Before the late Philip Handler left the presidency of the National Academy of Science (NAS), he set up a committee charged with the task of drafting an updated version of Vannevar Bush's "Science, the Endless Frontier."

"It appears to me," said current NAS president Frank Press recently before the House of Representatives Science and Technology Committee, "that we must once again reaffirm the credo so aptly outlined (in Bush's 1945 report) . . . That the advancement of science is inevitably in the public interest."[4] Whether they will be able to pull this off a second time remains to be seen.□

ORGANIZING FOR DEMOCRATIC CONTROL OF SCIENCE

Ralph Nader, Albert Meyer from the Natural Resources Defense Council, and David Noble are forming a special commission to work on issues of corporate control of science. For information about the group contact: The Special Commission on the Corporate Control of Academic Science, c/o the Center for Study of Responsive Law, P.O. Box 19367, Washington, DC, 20036, (202) 387-8034.

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Every other year since 1976 Dr. Philip Bereano and Dr. Ivy Durslag have taught this course on women & technology. The academic interdisciplinary course presents the politics and social impact of technology on women's lives through the writings of critics as Hazel Henderson, David Dickson, Ruth Cowan, Murray Bookchin and others. Write them for a full description.

Science & Sexual Oppression: Patriarchy's Confrontation With Woman And Nature, Brian Easlea, Weidenfeld & Nicolson (91 Clapham High Street, London SW4 7TA England), 1981, approx. $20.00.

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This committee of the Society for the History of Technology is out to prove that history is full of contributions to technology made by women. Their informative newsletter is full of cases to prove their point.

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CHAPTERS AND CONTACTS

Science for the People is an organization of people involved or interested in science and technology-related issues, whose activities are directed at: 1) exposing the class control of science and technology, 2) organizing campaigns which criticize, challenge and propose alternatives to the present uses of science and technology, and 3) developing a political strategy by which people in the technical strata can ally with other progressive forces in society. SftP opposes the ideologies of sexism, racism, elitism and their practice, and holds an anti-imperialist world-view. Membership in SftP is defined as subscribing to the magazine and/or actively participating in local SftP activities.

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