David Noble on Automation Madness

SCIENCE FOR THE PEOPLE

Vol. 18 No. 1

$2.50

Stopping Star Wars

Preview

Welcome to the first issue of our eighteenth year! This year, we've resolved to improve the magazine's financial health and keep our readers informed about SftP's non-magazine activities.

Seven members of Science for the People started the new year by traveling to Nicaragua to set up a university science teacher placement program. The delegation went with a full itinerary of meetings with officials from the Nicaraguan National Council of Higher Education and three universities in Managua and Leon.

During their visit, the group also began research on the state of higher education in Nicaragua. A report of their trip will be printed in an upcoming issue. The first group of visiting U.S. professors should begin teaching in March, but applications are still being accepted for the following semester, which begins next December.

Not all of our travels have been by plane. Science for the People has been moving in print, too. A French translation of our anthology Biology as Destiny was published by Jean Belkhir and Science Libre press. The International Journal of Health Services plans to reprint Ken Geiser's article, "The Chips Are Falling: Health Hazards in the Microelectronics Industry" (March/April 1985). That piece, along with three other SftP articles, were recently published in a special issue of the Global Futures Digest. "The Definitive Guide to High Tech", Ray Valdes's satiric comment on popular culture's fling with technology (March/April 1985), was reprinted by the San Francisco Chronicle. And SftP articles continue to be included in textbooks, curriculum guides, anthologies, and grassroots publications.

On April 19th, Science for the People will co-sponsor a conference on science and the media. Primarily intended for science journalists, the conference will focus on reporting scientific information to a general audience. Workshops and speakers will discuss the difficulties in evaluating the validity of scientific reports and their implications, the biases affecting the way science news is presented and the choice of stories that are reported, and the tensions for science journalists of being both educators and critical evaluators of scientific research.

To support all of this activity, would you consider becoming a member of Science for the People, if you aren't already? Membership connects you to a network of over 500 scientists, teachers, activists and students who share your interest in the role of science in society, and who are part of a science community that puts human needs first. For $30 a year, you will receive a subscription to SftP, the national newsletter and other office mailings. Just use the reply card enclosed, and we'll add you to the list.

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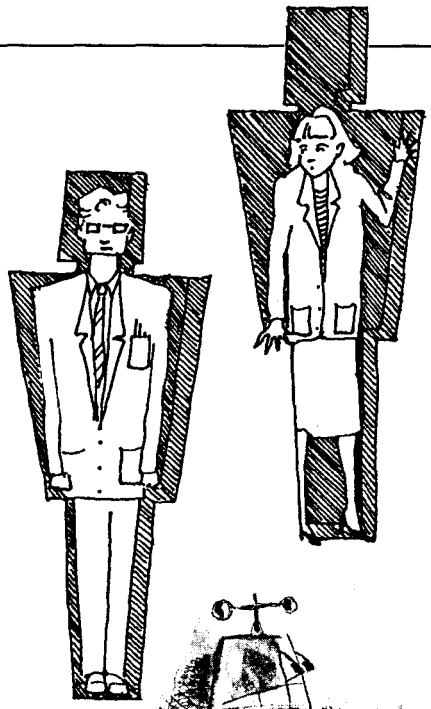

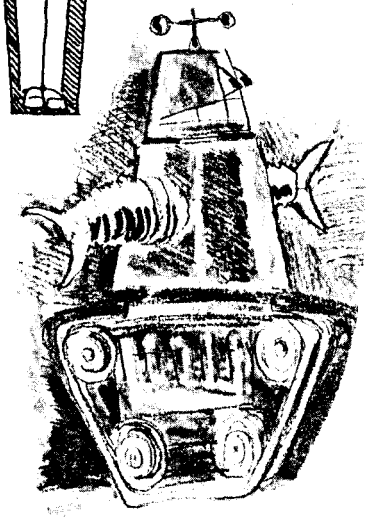

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Make Your Own Clone

Remember the chemistry sets precocious kids used to get for Christmas, replete with test tubes and small quantities of many common lab chemicals? Now a new generation of kids—at least those whose parents are willing and able to fork up $599—can switch over to playing with living organisms, courtesy of "Dr. Cloner's Genetic Engineering Home Cloning Kit."

The kit is already raising controversy over its safety. It includes an electrophoresis apparatus to separate genes, solutions, an incubator, a magnifier to see the genetic fragments—in short, all you need to do the type of rudimentary cloning experiments that only a few years ago were in the exclusive domain of some of the most sophisticated biological labs.

What are the risks of such a home genetic engineering kit? They're hard to verify, but some critics, like Sheldon Krimsky of the Committee for Responsible Genetics, are afraid that disease-causing organisms might accidently be made resistant to antibiotics, potentially putting the experimenter, as well as friends and relatives, at risk in contracting a disease that would be difficult to treat.

Craig Comeau

Larry Slot, the creator of Dr. Cloner, acknowledges concern about the kit, admitting that it may be potentially dangerous, but brushes aside the concerns, stating "I have taken the dangers into consideration, but discoveries are made by people who take risks, and I really feel the planet cannot afford not to take this risk."

Slot isn't taking too many risks for his company, Gemensco, which markets the Dr. Cloner kit, however. They are careful to include a certification to be signed, copied and returned to the company stating that the owner "shall hold the manufacturer, dealers, and all persons connected with the sales of this kit blameless for any harm resulting from the intentional misuse of the chemicals and/or apparatus contained in it, while it is in my possession."

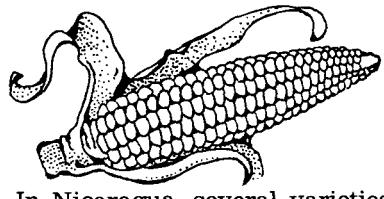
Perhaps Slot feels this is good enough, but our concerns are not allayed. Especially when the same certificate is all that guarantees (through the experimenters' promise) that they will never use the kit "for any purposes which may or may tend to violate the National Institute of Health's Guidelines for Research Involving Recombinant DNA Molecules," or that they shall not use the kit for "the purpose of causing harm to any living creature."

—Seth Shulman

Seed Embargo

When President Reagan enacted a trade embargo against Nicaragua last spring, he withheld Nicaraguan crop seed stocks that were being stored in a gene bank in Colorado. Not only an act of U.S. political power, this was one more example of how the developed world controls the crop seed of poorer third world countries.

Because of artificial selection of the world's crops, the genetic diversity of many plants has narrowed. To preserve remaining "wild" genes, crop seeds from southern climates, where diversity remains high but cold storage and agricultural research facilities are in short supply, are often sent to seed banks in the richer developed countries.



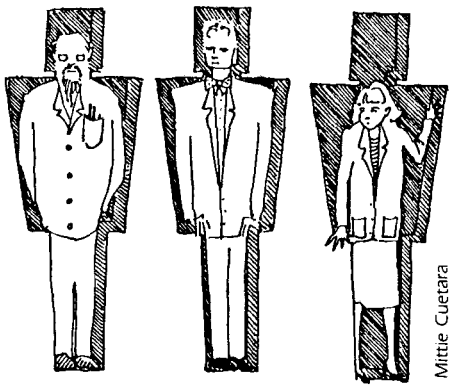
In Nicaragua, several varieties of maize and bean have evolved. Seeds from these plants were collected and stored outside the country, because Nicaragua had no seed bank. CIMMYT, the International Agricultural Research Center for wheat and maize in Mexico, were overseeing the storage, and had sent the Nicaraguan seeds to a gene bank in Colorado, without keeping any duplicates.

When Nicaragua built its own gene bank, they asked CIMMYT to return their seeds. But the U.S. Treasury Department claimed that the embargo included genetic material from Nicaragua.

CIMMYT eventually obtained 64 samples of Nicaraguan plants from the U.S. and sent them to Nicaragua. But Nicaragua wanted more of its samples returned. Half of the samples that were sent back were dead, and the rest had a very low rate of germination.

Poor countries like Nicaragua fear that they are losing their seed stocks to the developed world. The third world holds less than a third of all known genetic stocks, while industrialized countries hold more than 90%.

—information from New Scientist



Mittie Cuetara

Fear of Science Careers

Young women with high achievement test scores in their senior year of high school are not choosing careers in science because they don't believe those fields are compatible with marriage and family. Those are the results reported by Norma C. Ware of Radcliffe and Valerie Lee of the Educational Testing Service, whose findings were based on an ongoing national study of students' goals, aspirations, experiences and achievement patterns called "High School and Beyond."

Students were tested as high school sophomores in 1980 and again as seniors in 1982. Ware and Lee used the path analysis technique to isolate factors which predicted whether or not a student would choose a science career. They focused only on students scoring in the 50th percentile or higher in achievement tests. Of 1,212 young women in this group, only 187, or 14%, later chose a science major, compared to 40% of 1,280 young men.

Young women who placed a high priority on family and personal life and who said that their college plans were influenced by high school teachers and counselors were the least likely to choose science majors. Norma Ware admitted that these perceptions are not totally imagined, due to the slow social change in scientific professions. "Perhaps something is trickling down to them about what's possible," she said.

—information from the Boston Globe

Federal Auction

As an editorial in the *New York Times* recently remarked, "When the White House airily proposes selling the Federal Housing Administration to private bidders, citizens might well wonder what's next on the list." Second guessing the administration, the American Civil Liberties Union (ACLU) has already made an offer.

In a letter to Attorney General Ed Meese, the ACLU offered to bid on the Justice Department, to help the government rid itself of "unwanted responsibilities and at the same time restore a healthy balance sheet to your Civil Rights Division, whose liabilities now exceed its assets." The ACLU said that it's particularly interested in the Justice Department because, of all the branches of government, that seems to be the one the administration is "the least interested in developing."

Taking the ACLU's lead, we at SftP are drafting our own proposal and will be submitting an offer to purchase the Occupational Safety and Health Administration (OSHA). OSHA is a clear victim of neglect by the Reagan administration. By pooling the resources and expertise of our friends and members in labor and occupational health, we think we could do a better job of protecting workers' health and safety.

—Seth Shulman

Brain Damage at Work

Studies of humans and animals report that "humans occupationally exposed to microwaves of moderate to high intensity could be at risk of brain damage." Dr. Hans-Arne Hansson, a neurologist and chief researcher of the study at Sweden's University of Goteborg, found a pattern of abnormal proteins in the cerebrospinal fluid of 17 radar technicians who had all worked for several years servicing radar equipment. No such changes were found in a matched group of men with no history of microwave exposure.

Experiments performed on rabbits who were exposed to microwaves showed the same changes as the radar technicians. When the rabbits' brain cells were examined microscopically, they showed signs of brain damage.

In the U.S., Andrew Loesch, a 54-year-old former radar technician who is terminally ill and worked for the Federal Aviation Commission, has filed a suit against the FAA. He claims that "the long-term exposure of microwave radiation resulting from his employment with the FAA caused this brain tumor." Loesch will use the Swedish study's findings in his suit. He and two other coworkers suffer similar medical problems that they believe were caused by their occupational exposure to microwaves.

According to a 1982 OSHA study, about nine million Americans are exposed to microwave radiation at work. The majority, 6.6 million, are communications workers, while 195,000 work for the military.

The Swedish study does not address the dangers of microwave ovens or video display terminals, whose radiation differs from that emitted by radar.

—Boston Globe

Newsnotes

Ice-Minus: Plus or Minus?

Up here in New England, frost has a special place in our hearts. Our famous poet, Robert Frost, was fond of punning on his name as he wrote about the rugged landscape of Vermont. Thanks to the wonders of genetic engineering, frost may become more common in poems than on pumpkins. This past November, the EPA approved the first controlled release of a genetically engineered organism, the "Ice-Minus" bacteria (see *SftP* May/June 1985, "Ice Minus and Beyond," by Matthiessen and Kohn).

Ice forms on plants at temperatures of 0 to -7C because of the presence of a bacterium, *Pseudomonas syringae*, which produces a protein-enabling ice crystals to form at those temperatures. Without this protein, ice forms only at temperatures lower than -7C.

Scientists at Advanced Genetic Sciences, Inc., have engineered the gene responsible for the protein out of the bacterium. They're ready to release the new bacteria into the environment by spraying 2,400 strawberry plants with the Ice-Minus organism. The only barrier to the environment at large is a 49-foot bare strip of earth around the field.

Even the EPA concedes that the testing will offer the microbe an opportunity to escape the testing ground. It is claimed (and fervently hoped) that the microbe will simply not be able to compete in the rough and tumble world of vegetation.

Others are not so sure. Questions have been raised about possible effects of a flourishing Ice-Minus population on weather patterns. Senator Albert Gore (D-Tenn.) has decried the informal approach to oversight practiced by the Reagan administration's Biology Science Coordinating Committee.

Jeremy Rifkin, president of the Foundation on Economic Trends, filed a lawsuit to block the testing of Ice-Minus outside of the laboratory. He charged that

the EPA hadn't adequately tested the microbe for its potential to spread or cause environmental damage.

The EPA admits that it has not even considered the possible impact of Ice-Minus at large. How they were able to conclude that the new organism could not compete beyond the strawberry patch remains a mystery.

—Gary Keenan
information from
Environmental Action

Newsnotes are compiled and edited by Leslie Fraser.

U.S. Fights for Pesticide Exports

In late November, the Food and Agriculture Organization (FAO) of the United Nations approved an international code of conduct for pesticide use and distribution. But the U.S. and E.E.C. blocked a stronger provision that would have made third world countries aware of pesticides which are banned or restricted in other countries before their sale in the third world.

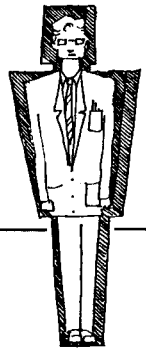
The FAO's new code asks industry to use packages which are child-proof and "not attractive for subsequent use." In some areas, pesticide jars have been used for water. The code also states that labels should be written in local languages that take account of literacy levels.

Pesticides should be ready-to-use, since many accidents occur when the chemicals aren't diluted before use, and the code states that they should be "less toxic." Furthermore, advertising shouldn't use scientific jargon "to make claims appear to have a scientific basis they do not possess."

The provision which third world countries approved last year and the U.S. vetoed would have required the importers of pesticides to acknowledge that they had received information from the exporters as to whether the pesticide was banned or restricted in its country of origin, and approve the shipment before it could be sent. Since the U.S. is usually the exporter and the third world the importer, this would have meant a loss of sales for U.S. companies. To make their case even stronger, the U.S. inserted a provision into the pesticide code stating that no such exchange of information should delay or prevent sales.

Third world countries agreed to the watered-down version so that the pesticide code would pass this year.

—information from New Scientist



WOMEN AND SCIENCE

Re-naming and Re-searching Reality

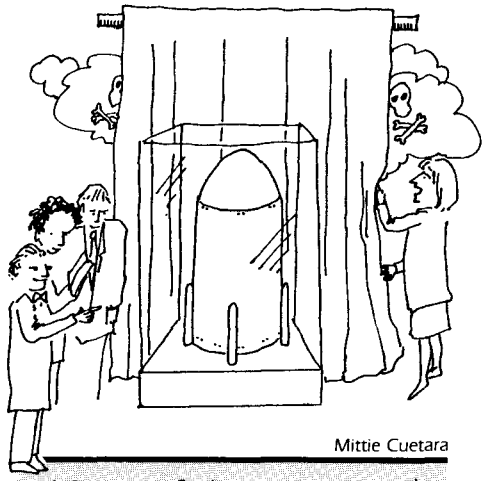
by Barbara Dodds Stanford

The problem of the lack of participation of women in science has been the subject of a number of studies recently.

Cases of overt discrimination have been documented, social and political barriers to the participation of women in science have been studied, and the relationship between genetic and environmental factors has been explored.

My own experience and observations of women tackling science-related programs suggest another dimension to the problem. While I have heard women relate cases in which they were told bluntly, "We don't want women in our program," I have heard more stories in which women were discriminated against or discouraged because they were challenging some of the fundamental assumptions of science and the privileged position of their opponents.

I would like to suggest a new framework for analysis of the relationship between women and science. I think that the relationship can be analyzed more fruitfully as a conflict between the establishment and the vanguard of revolution, than an attempt to gain entry to the field by an underprivileged group which lacks the skills and motivations to compete. Most of the women I have talked to about science are not interested in participating in the present structure of science. They are interested in radically transforming it.



Mittie Cuetara

Most of the women I have talked to are not interested in participating in the present structure of science. They are interested in radically transforming it.

The cause of many women's failure in science is not in women's mental capacity, social pressures, educational techniques or male discrimination, but in fundamental epistemological weaknesses in the prevailing scientific paradigm, and the resistance of the scientific power-structure to change. Discrimination, I propose, is a symptom of the problem, not the cause. An obsolete structure with a hierarchy clinging to privileges it no longer deserves has to defend itself against the revolutionaries, or at least screen very carefully those that it coopts.

Perceptive Differences

Carol Gilligan's 1982 study, *In a Different Voice*, provides a useful framework for reexamining the relationship of women and science. In her study of the normal, healthy moral and psychological development of women, Gilligan discovered that her subjects had a very different way of perceiving, categorizing and valuing reality than the male subjects in similar experiments.

Previous male experimenters had detected some of the characteristics of the conceptual framework Gilligan discovered. However, they had defined the differences between women's thought patterns and men's thought patterns as failures of women to achieve the male model. Gilligan simply could not accept the results of an experimental model which consistently found women to be less morally mature than men.[1]

Gilligan discovered that women's failure to measure up to the standards of moral judgment set by males was not the result of their immature thought patterns which made them unable to use the male standards. They understood the male standards perfectly well and rejected them.

For example,one of the problems researchers asked subjects involved a man who did not have the money to buy medicine needed to save his wife's life. Subjects were asked to decide whether it was moral for him to steal the medicine and save his

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Barbara Dodds Stanford is the author of several books, including Peacemaking: A Guide to Conflict Resolution for Individuals *and* Groups and Nations, *and a consultant in peace education, group dynamics, and conflict management.*

wife's life, or let her die. A typical male response, rated highly by the researchers, was that the man should steal the medicine because his wife was worth more than the medicine.

A typical female response was to explore the alternatives which were not presented by the researcher, such as borrowing the money, talking it out, or finding a way to make the money. However, the researcher would not accept these answers and conveyed his disapproval by trying to force the subject back to the original two-choice dilemma. Her answers became more constrained and unsure. At the end of the interview, the researcher noted her inability to think systematically and rated her response a stage lower than the boy who could compare a life and medicine in financial terms.

Yet the girl had not failed to solve the problem because she lacked reasoning skills. She had made a sophisticated judgment that the problem itself was faulty and that the solution required redefining the problem.[2]

That incident has been replayed hundreds of times in the experiences of the female scientists I have talked with. Their conflicts with the scientists in positions of power over them have come when they have tried to question the paradigm, to rephrase the problems, and to redefine the variables. Their efforts have consistently been rejected as "lacking in experimental rigor" or "irrelevant."

Gilligan's research at last made visible the phenomenon which my friends and I have felt and sensed for so many years. Women appear to fail at science because they tend to operate with a different paradigm than that which the scientific establishment imposes on a novice.

The Relationship Perspective

The "female" or relationship perspective which Gilligan describes is based on a conception of the world as a web of relationships, in which the self is defined by its relationships to the larger whole and to the other parts of the whole, rather than as an independent entity. The web is seen as made up of differing and conflicting parts, which all play a part in the whole. The world is a constantly changing network of relationships.

Gilligan's ideas have much in common with what Fritjof Capra calls the yin or intuitive mode of

> It was not just the blood and sliminess that bothered me. Underneath the act of dissecting a frog, I dimly perceived a view of the world which I could not assent to.

thinking. Throughout history, myths have associated this type of thinking with women, yet there is plenty of evidence that men are capable of using it.[3]

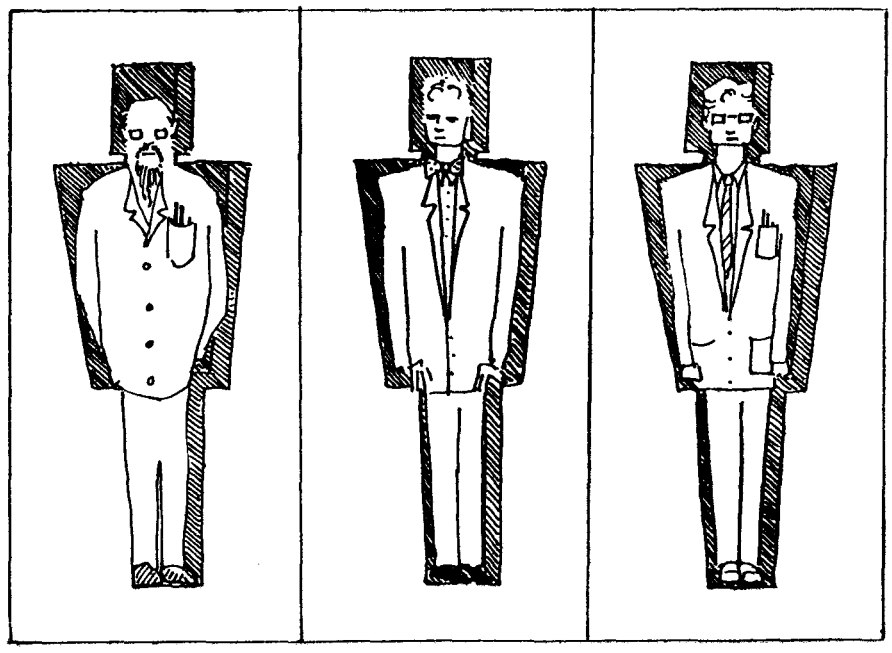
This paradigm is directly opposite to the premises of Newtonian science. It denies the possibility of objectivity. Along every point on the network of relationships, a different reality is visible. It rejects the claims for "pure" or "value-free" science. It sees the scientist's analysis as being determined as much by parameters of geography, class, and culture as is the analysis of a Black Power leader or an Amazon Indian.

The relationship perspective denies the validity, or at least the generalization, of analysis based on isolating variables from their environment. The definition of variables may have more impact on the outcome of the experiment than the observed results of the experiment. This perspective even questions the reliability of observation as a means of arriving at an absolute truth.

If women with the relationship perspective reject the premises of Newtonian science, their perspective is even more strongly denied by the scientific establishment. The mental paradigm with which a large percentage of women seem to view the world is systematically defined as nonexistent by the laws of traditional science.

I was discouraged from entering a scientific field not because I looked like a woman but because I thought like a woman. As long as I played the game and did research by Newtonian rules, my work was treated with reasonable respect—though it was never of very high quality.

I went through the motions of educational research to get my degree, but I could never regard analyzing children with a research methodology designed for corn fields as anything more than a game of Trivial Pursuit. My male instructors and classmates responded to my attempts to question the paradigm with indulgent smiles



and comments like, "You don't really want to stay in graduate school all your life, do you?"

Women are capable of being successful scientists, just as men are capable of operating by the relationship perspective. However, even successful women scientists often are unable to ignore the contradictions between the rules of the laboratory and the way they see the world. Dr. Elise Boulding, in a study of women in disarmament research, discovered that many women feel a personal need to alternate between academic research and education and action work. Since education and social action pay less than academic research, and since few academic institutions make provisions for this kind of career pattern, the structure of work keeps women from higher positions and pay.[4]

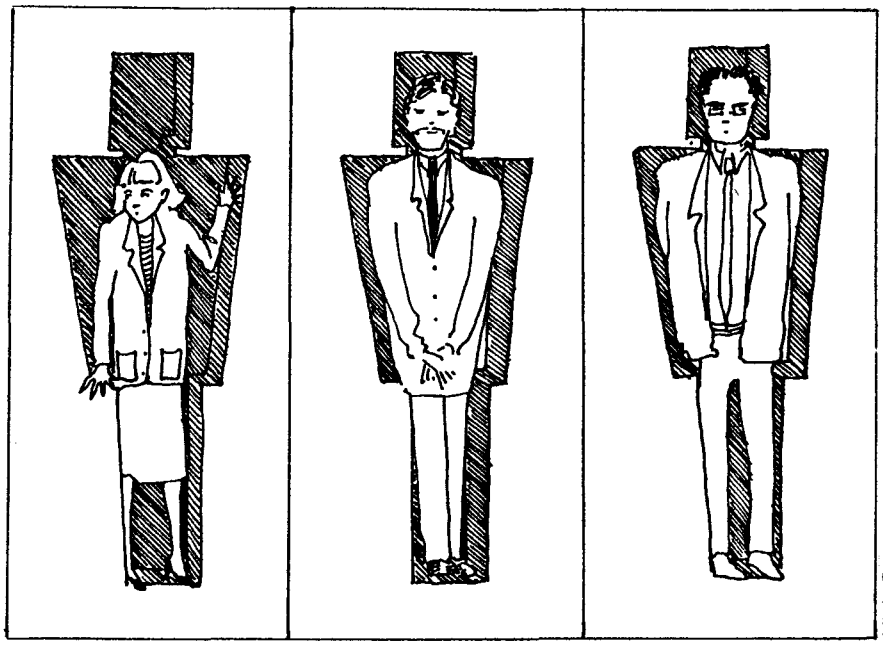
Deciding Against Science

Dr. Regina Groshong spent ten years doing significant and respected research in psychobiology. However, she is no longer working as a scientist. "When I looked at my work from the perspective of the real world," she says, "it didn't seem important. I loved the laboratory. I spent some of the happiest times of my life working there, but I also felt like it was an escape, a way of avoiding dealing with real people and real problems."

Dr. Alison Sanchez, Director of the Museum of Science and History in Little Rock, Arkansas, is another example of a woman who rejected a career in science because she found that science contradicted her basic values, after being rejected by a prominent scientist because of her female perspective.

> I went through the motions of educational research, but I could never regard analyzing children with a methodology designed for corn fields as anything more than a game of Trivial Pursuit.

"I was taking a course from Dr. Garrett Hardin on Human Ecology, and one of the assignments was to write an essay on choosing between injustice and chaos. I argued that injustice would lead to chaos and got a "C." A sample "A" paper said that injustice should be tolerated because, with chaos, who would drive the trucks to the supermarket?



Mittie Cuetara

"I walked out, dropped the class, and changed my major from biology to anthropology, a discipline where humans are not equated with rats."

For many women the decision against science probably comes much earlier, at an age when they are unable to verbalize their objections to science, and when they lack the ego strength to declare their teachers and parents wrong.

I think that my own subconscious decision against a career in science was made when I discovered that the initiation rite required for admission to high school science courses was the cold-blooded murder of a frog. At the time I could only describe my perceptions in emotional terms, and neither I nor anyone around me recognized emotions as a form of information processing which is often more accurate than rational thought.

I could not explain it at the time, but it was not just the blood and sliminess that bothered me. Underneath the act of dissecting the frog, I dimly perceived a view of the world which I could not assent to.

I could not accept the premise that one could only understand a frog by taking it apart—that the essential constituents of a live frog were present in the pieces of a dead frog. My world view said that a living being is more than the sum of its parts. While my concept was not denied by the biology teacher, we spent much more time studying the parts of the dead frog than the relationships of a live one.

Even more important, however, I sensed that my relationship with the frog was as real and important as, or more important than, the relationship among the organs of the frog. It was this premise which my teacher, my parents, and everyone who wanted me to succeed in the world denied. When I tried to raise questions of ethics and morals, I was dismissed as a squeamish girl who probably was not fit for a career in science.

I tried my best to repress and deny what my eyes and my mind told me—that I was a part of a larger whole and that my movement of a stick or crushing of a mosquito was as much a force of nature as gravity, and that my relationships with the other parts of the biosphere were as deserving of study as the relationships between water and land.

In chemistry, I was able to suspend rebellion against the prevailing ideology and to pour liquids from one test tube to another as if I were an outside observer recording an event of unrelated inanimate objects. I was

able to ignore the fact that some of those molecules I was observing dispassionately had been a part of my own body only moments earlier.

But in physics, I was unable to view the release of energy from the atom objectively. That more persistent part of my brain felt the shattered atoms as a shattering of my world. My mind went numb and I dropped out of science for twenty years. I am only now beginning to return, as I am able to verbalize my awareness that the physical, scientific conditions required to create nuclear weapons are not defined only by the relationships of various kinds of atoms, but also by the structure of a society.

An atomic bomb is an entity which requires for its production not only uranium and certain kinds of processing plants. It also needs an industrialized, militaristic society in which the ruling elite are willing to sacrifice the health of their workers and of their environment, and the citizens are willing to accept the decisions of a managerial class. My decision to pay or not to pay my taxes plays as critical a role in the constuction of an atomic bomb as the placement of an atom of uranium. That observable, measurable relationship has been denied by male-dominated science.

Women Question Star Wars

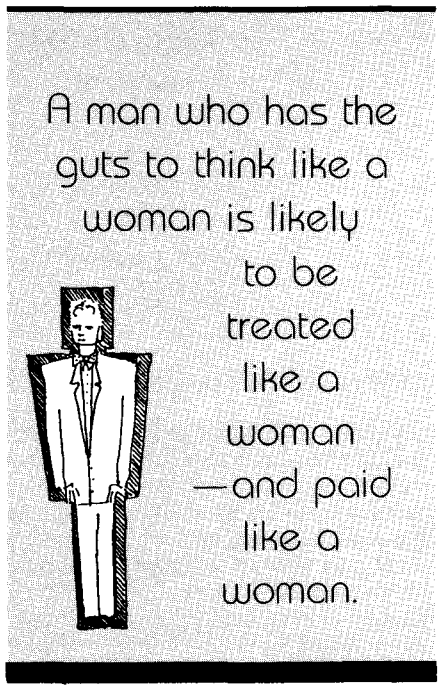
The tremendous loss of scientific knowledge caused by the denial of women's perceptions and the acquiescence of women in the male-dominated model is nowhere more evident than in the debate on the Strategic Defense Initiative, generally known as Star Wars.

In spring 1983, shortly after the first public debates on Star Wars research began, I asked eleven white, female elementary school teachers to list in two minutes all of the questions they would want the government to ask before it decides whether or not to build a system of space satellites equipped with laser or particle beam weapons which could destroy enemy missiles in the air.

I quite frankly expected these elementary school teachers to claim to be allergic to physics and shrug their shoulders. However, the results were startling. In two minutes the eleven women wrote 25 different questions and concerns they had about the new weapons system.

I then compared their questions with the issues raised by the reporters of *Newsweek* and *Time* magazines in major features. Only 14 of the 25 concerns raised by the women were mentioned by either news magazine, or by any of the government officials, scientists or critics that they interviewed. Incidentally, all 24 individuals mentioned or quoted in the *Newsweek* article were males, though three out of ten of the reporters were female.[5]

Both the women and the magazine article questioned the technological feasibility of the new plan; however,



the types of questions they asked were quite different. The magazines focused on questions which evaluated the system as a discreet entity and questioned its internal validity. The women seemed to perceive the weapons system operating in relationship to the environment:

"What happens to the laser beam if it misses the intended target?" "What will it hit?" "Is there any chance of activation by anything other than a missile?" "What dangers are posed by satellites falling?" "Has adequate research been done to assure that it's harmless to the environment?" "What will the effect of deployment be on weather and health?"

The second major category of questions involved costs. The magazine noted that Reagan denied the relevance of cost to the issue: "Underlying Reagan's speech last week was his unwavering contention that questions about the proper level of military spending should be divorced from the nation's overall budgetary and fiscal situation."

Both *Time* and *Newsweek* interviewees questioned the costs of the proposed system, as did the women. But again the women raised a perspective on costs ignored by both magazines. The women also described costs in missed opportunities: "Couldn't we spend the time and effort on other things?" While both magazines noted the possible effect of the new system on alternatives already being discussed, such as the ABM Treaty and the Nuclear Freeze, their respondents did not suggest, as did the women, that there may also be other possibililties that have not yet been explored that might be lost by development of the weapons system.

Both the women and the news magazines noted the potential effect of the new weapons system on the U.S.'s relationship with other countries. However, the magazine considered primarily bilateral effects, while the women posed questions in the context of the global system: "Who decides the boundaries in space?" "Who will negotiate the outcomes of conflicts which will inevitably arise?"

Two women raised another perspective not noted by the magazine articles, questions which indicated an awareness that systems change over time: "How long would it be before this plan of defense would phase out?" "Might this prove unnecessary in the long run?"

It might be logical to assume that the women's concerns were raised out of ignorance and that these questions were not mentioned by scientists because they had already been adequately addressed. Indeed, that is true of a few of the questions about environmental effects. However, on the whole, these questions are not yet being addressed about Star Wars, and in fact are only now, after 40 years, being asked about nuclear technology. With nuclear technology we have seen the tremendous costs and dangers which have resulted from the inability or unwillingness of scientists to conceive of environmental impact, opportunity costs, and an awareness of the change in systems over time.[6]

Our Relationship to Nuclear Technology

Elizabeth Dodson Gray, in a talk to a group of women in Little Rock, Arkansas, recounted an encounter with a man who was a major decision maker in the development of atomic power. She asked him why it took the government so long

to deal with the problem of nuclear wastes. She reported that he paused and responded, "I never thought of that before. I guess we didn't really think it was important.

"No woman would have ever made that statement!" Dodson Gray continued, to unanimous agreement from the audience.[7]

The Office of Technology Assessment's 1979 publication, *The Effects of Nuclear War*, illustrates how extreme the perceptual deficiency of nuclear policy makers has been. The ecological impact of nuclear war (including the whole nuclear winter problem) is discussed in one sentence: "A 1975 study by the National Academy of Sciences (NAS) addressed the question of the possibility of serious ecological damage, and concluded that while one cannot say just how such damage would occur, it cannot be ruled out."[8]

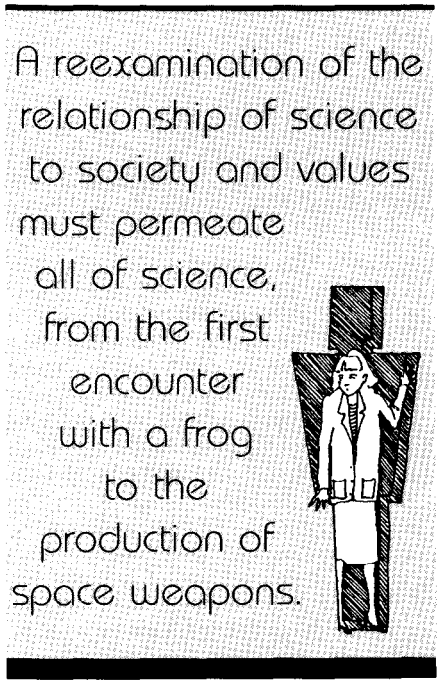
The possibility that the effects of a nuclear war on a society might be more than the sum of the effects on mannikins is discussed in a couple of sentences in Appendix D:

"Although these analyses describe the direct effects of nuclear attacks in terms of population fatalities and attack damage objectives against military, leadership, and economic target systems, it is recognized that a more meaningful basis for assessing the direct effects of nuclear attacks would be to analyze the effects of such attacks in terms of postwar national survival and recovery. To date, however, analytical capabilities have not permitted such analyses. In fact, the complex issues concerning national recovery should nuclear war occur, or the postwar power and recovery capabilities of the belligerents, have as yet not even been properly formulated for analysis. Until that is accomplished, analyses of the direct effects of nuclear attacks will continue to focus, as have the studies used for this analysis, on one-dimensional first-order direct effects."[9]

In other words, the scientists who produced this study admitted that they had not been capable of developing the kind of analysis the elementary school teachers intuitively insisted was needed. More devastating, instead of admitting that they had failed at their task, they produced a report claiming to describe *The Effects of Nuclear War*, knowing that it was a fraud, that what they were describing was only a fraction of the real effects of nuclear war. This study was used for developing national policy for several years, and we are probably still paying for the dishonesty of these scientists who were unable or unwilling to say, "We don't know what the effects of nuclear war are. They are, at this point, beyond human analysis."

Learning New Paradigms

During the last five or six years, the need for scientists to become concerned with the relationship perspective has become more apparent. Books such as *Fate of the Earth* and the nuclear winter studies have belatedly begun to consider the effects of nuclear war on a planet instead of in the abstract. Courses in science, technology and society have become popular at major universities.



Student Pugwash sponsored a symposium entitled "Young Scientists, Education and Social Responsibility" at the 1984 meeting of the American Association for the Advancement of Science in 1984. One of the participants, Kathryn Harrison, pointed out, "As an undergraduate, I was introduced to a way of thinking which not only disregarded the social consequences of engineering, but actually devalued such considerations.... I never encountered an in-class discussion of the social impact of a technology."[10]

In a survey for the seminar, they discovered that many young scientists changed from science and engineering to science, technology and society or science policy programs when they became concerned about such issues. Many left science or engineering to go into science or technology policy work or public interest research groups.

Student Pugwash suggests a required course on science, technology and society—but the problem is more fundamental than adding on a "women's auxiliary." A fundamental redefinition of science and reexamination of the relationship between science and society and science and values must permeate all of science, from the first encounter with a frog to the production of space weapons.

The greatest challenge of science in the post-Einsteinian twentieth century is the development of a new paradigm of science which is capable of at least perceiving, and possibly of analyzing, the kinds of interactions in which the human species is now engaged with the biosphere. Einstein was quite right that the new technology released by the splitting of the atom makes our survival dependent on developing a new way of thinking.

Groping toward a new paradigm has been a major activity of scientists in the past few decades. The invention of new disciplines, such as ecology and peace research, has contributed new methodologies. Systems theory has explored ways of conceptualizing relationships which do not fit in the traditional cause-effect pattern. Science for the People, the Union of Concerned Scientists, and Physicians for Social Responsibility are beginning to make visible the relationships between the scientific laboratory and the political, social, and economic aspects of society.

However, the repressed and denied intuitive perceptions of women are a tremendous resource for this difficult task. When (and if) the history of the twentieth century is written, Greenham Commons and the feminists' ribbon around the Pentagon may be recognized as major events in science, for in these and similar actions around the planet, women are challenging the system which has enslaved science as an instrument of destruction.

By putting their bodies on the line, these women are modeling in four dimensions, instead of two, a new paradigm of science. For an essential component of the new paradigm is the realization that power, love, and hate are forces which distort the lines of rational thought and scientific analysis.

An outdated paradigm is not the only obstacle that kept the scientific establishment from confronting the effects of nuclear war for 40 years. Many male scientists recognized, as well as any woman could have, that

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STOPPING STAR WAR

by Seth Shulman

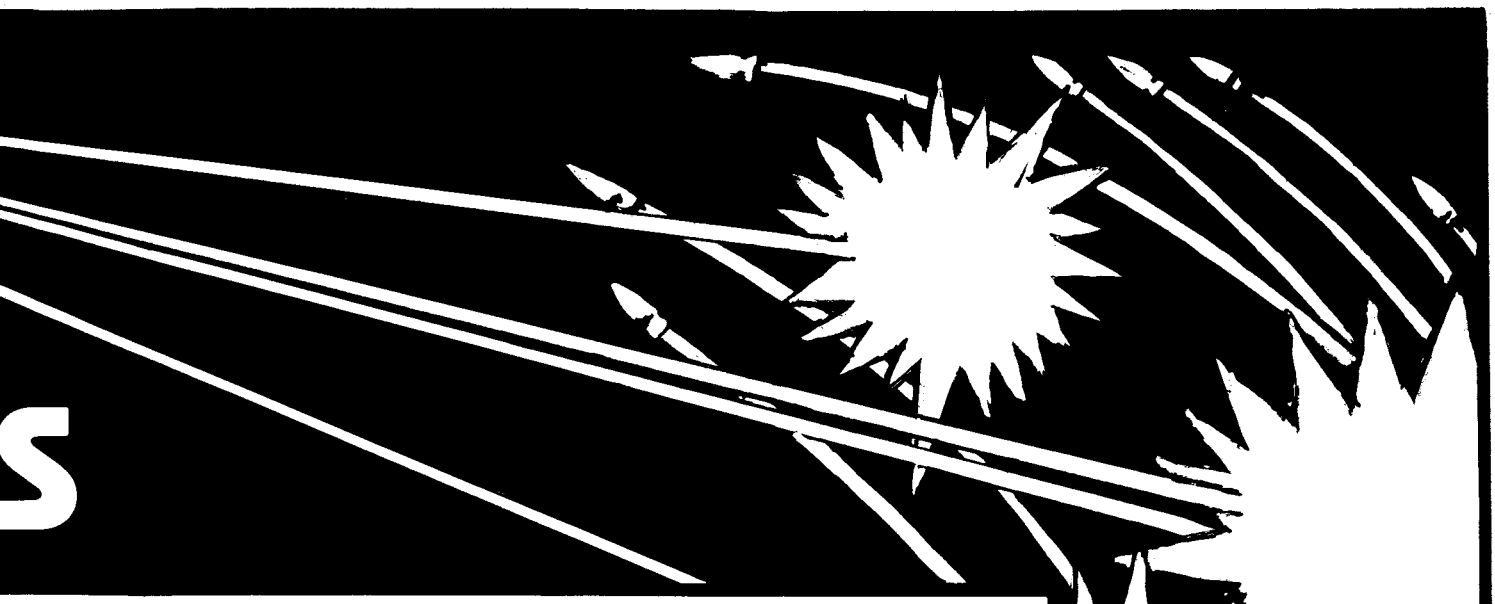
On university campuses across the country, controversy continues to grow about the $1.3 billion of the Reagan administration's Strategic Defense Initiative (SDI) earmarked for academia.

To date, over 2,400 professors and 1,700 graduate students eligible for the funds have signed a pledge to refuse to seek or accept SDI funding. Since its birth last summer, the SDI boycott has spread to over 100 of the nation's universities, causing heated debate about the role of academia in military research and, according to some inside observers, worrying SDI's proponents at the Pentagon.

Rarely, and certainly not since the Vietnam war, have scientists taken such a strong and organized stand against a weapons program. At 30 physics departments and 13 other science and engineering departments around the country, the pledge against SDI research has received support from a majority of faculty members. As of November 1985, the pledge had garnered the signatures of over 56% of the faculty at the nation's 14 top-ranked physics departments.

At Tufts University, the boycott reached a new level recently when the faculty voted to adopt a resolution to actually prohibit SDI research from the campus. Calling the proposed SDI program "objectionable on technical, political, and moral grounds," the Tufts faculty became the first in the nation to

Seth Shulman is a freelance writer on science issues and the former editorial coordinator of SftP. He is currently a Bush Fellow at MIT, and wishes to acknowledge the help of research done by Katherine Magraw.



urge their administration "to deny institutional approval of proposals submitted to the SDI Organization (SDIO)."

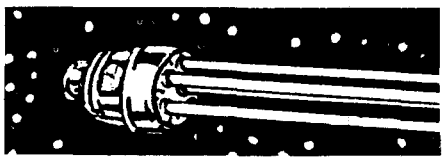
Until this time, the boycott had proceeded only on an individual basis. Tufts President Jean Mayer has opposed the faculty move, pending deliberation before the Tufts board of trustees. But binding or not, this vote by the Tufts faculty is a clear indication of the type of heated academic response the SDI boycott has prompted.

Watershed Move

Joseph Weizenbaum, professor of computer science at MIT, says that he hasn't seen anything like the SDI pledge, in scope or organization. "I'm very encouraged to see my colleagues grapple in such a responsible way with the issue of military funding in academia," he told SftP. Weizenbaum's sentiments are shared widely by many scientists across the country who are surprised by the extent of positive response that the pledge has received.

Professor Zellman Warshaft, an electrical engineer at Cornell University, has called the campaign "unprecedented" and "a watershed" in the history of modern weapons research. Scientists and engineers, he told a news conference on the MIT campus several months ago, have never before organized so widely to boycott the development of a specific weapon.

Many observers attribute the success of the SDI boycott to both the size and the directed nature of the research. President Reagan has asked for $26 billion for SDI research over the next five years, a total which represents what may be the largest mobilization of scientific resources in U.S. history. In addition, while the SDI funds slated for



academic researchers are billed as general, "no-strings-attached" research grants, the program's directed nature—aimed specifically at the development of a weapon system for use against ballistic missiles—raises profound questions for many researchers.

Says Vera Kistiakowsky, an MIT physicist: "This is not funding for basic research, but for a very narrow range of research in 17 areas that are related to the goals of SDI. It is a highly directed program. If it is decided that what a scientist does doesn't fit into that program, he or she will lose SDI support."

Star Wars and Academic Freedom

There are three aspects to the Star Wars research program that make it incompatible with the values and mission of universities. On the basis of these conditions, I believe SDI research should not be hosted at universities. Refusal of universities to accept such research on behalf of its faculty does not violate the principle of academic freedom. That should become evident when the purpose of the SDI research mission of fully understood.

First, the SDI research agenda will eventually lead to impediments on the free flow of scientific information. Some form of restraint on scientific communications is inevitable. The more useful a line of research becomes in supporting the SDI mission, the greater is the likelihood it will be placed under DOD or State Department controls. The refusal of many universities to accept classified research will only result in some creative solutions by DOD for controlling the flow of sensitive scientific information in the "wrong hands." Already, there has been talk about classifying the investigator and leaving the research (at its early stages) unclassified.

Second, the SDI research program circumvents the peer review system in science. Peer review insures that the most qualified scientists evaluate research proposals. At times, this involves collaboration between scientists in different countries. The principal consideration for peer reviewers is demonstrated achievement within a field of study.

SDI will make a mockery of the peer review system. Research proposals are evaluated by selected reviewers, primarily in-house DOD personnel. Because SDI proposals will inevitably involve sensitive military information, scientists, regardless of their status, who do not meet clearance criteria will be excluded from the process.

Since the research is mission-oriented and is designed to meet a national defense need, it can be argued that the traditional norms of science need not apply. The question is: Should we turn our universities into think tanks for national defense, when in the process the original functions of the academic institutions are severely compromised?

If universities buy into the SDI funding program, they will be helping to distort the scientific enterprise by legitimating an alternative to peer review, and by accepting a process for evaluating research that is not based on the quality of the knowledge it reveals about the universe, but rather on how it helps in the development of one military system.

Third, there is great clarity about the fact that SDI is a mission-oriented research funding agency with the singular purpose of developing a ballistic missile defense system. The explicit weapons mission distinguishes SDI from other DOD-funded basic research.

Universities can legitimately set limitations on hosting weapons research on the grounds that such research: a) is inconsistent with the broad aims of the university to pursue truth foremost, and barring national emergency, not to let power dictate the locus of scientific inquiry; b) creates dependencies within the university community for weapons policies; c) fosters an atmosphere that inhibits free and open discussion about the public purpose served in the escalation of the nuclear arsenal, by making the university into a financially interested party.

Academic freedom is a very weak defense against institutional isolation from the SDI research program, which is destined to undermine the healthy functioning of science and transform the university into a handmaiden of military technology.

Sheldon Krimsky
Associate Professor
Dept. of Urban & Environmental Policy
Tufts University

This box is excerpted from a longer essay by Sheldon Krimsky, which appeared in the Tufts Daily on October 17, 1985.

Another big issue among scientists in academia is that of classification of research. Since the Vietnam war, most major universities have refused to host classified research, viewing such secrecy as being in conflict with the academic premise of open intellectual exchange. Because so much of the SDI research will ultimately be classified, and because graduate students' dissertations must be published in open literature, the classification issue raises questions among even those scientists who might support the SDI project.

But unquestionably, the clear and growing sentiment among many outspoken scientists that the SDI project is technically infeasible and destabilizing has tipped the balance of many researchers' decisions in favor of the pledge. According to David Wright, a physicist at the University of Pennsylvania who helped draft the academic pledge against SDI, "If there wasn't such widespread agreement that the project doesn't make technical sense, we might not have seen such widespread support."

Tough to Refuse

While many scientists and engineers have made the decision to join the SDI boycott, the decision to refuse research funds is not always an easy one. As Charles Schwartz, physicist at the University of California at Berkeley, and one of the founders of Science for the People, explains, "What is significant about the pledge is the large amount of support from well established people in physics and some other departments, not just stating something is bad, but actually refusing funds. In that sense it is really an unprecedented effort."

Donald Probstein, an MIT professor of mechanical engineering and a missile expert who was offered SDI money, said he had to think carefully before turning it down, even though he does not believe that SDI is a feasible research problem. "I don't think SDI makes sense," he says. "But I have to say I wasn't brave enough to turn the money down immediately. I keep worrying about what I'm going to do if my research funds run out, and believe me, they're getting harder and harder to get."

This notion is echoed by Probstein's colleague John Melcher, an electrical engineer at MIT who is circulating the petition in his department: "Every individual signing is making

quite a sacrifice. It takes a lot of guts. The whole history of MIT says that you get the latest equipment and plenty of money to do exciting work in the 'service of the nation.' It's now so standard that we expect it and accept it without question."

Melcher says that, while he has found a lot of support for the pledge in his department at MIT, it is not a decision that is taken lightly. "Every signature requires at least an hour of discussion."

According to an interview published in the *San Francisco Examiner* with physicists at Berkeley, one researcher had already submitted a proposal to the SDIO before he changed his mind and signed the pledge. He told reporters that in light of all the discussion about SDI, he had changed his mind about the project and wouldn't accept the funds now, even if they were offered.

Effect of the Boycott

How much impact will the SDI boycott have on the program? In terms of direct impact, this question is in dispute. Pentagon spokesperson Lieutenant Colonel Lee Delorme told the *New York Times* that the military did not expect the pledge to have any effect on the program. The Pentagon has repeatedly stressed the fact that SDIO has received 2,600 proposals for SDI-related research. Nonetheless, there are several clear signs that the administration is concerned about the boycott and may already be feeling its effect.

As Vera Kistiakowsky puts it, "The Pentagon can always find scientists to do their work, but if they can only get second-rate scientists, then they will get second-rate research." Not so, according to James Ionson, the director of the SDIO's Innovative Science and Technology branch, who reportedly responded to this sentiment with the quip: "Two second-rate scientists are as good as one first-rate one."

Other SDI proponents are not as cavalier as Ionson, however, and express concern about the project's ability to attract talented researchers in light of the boycott. One SDI supporter, Robert Sproull, former president of the University of Rochester, recently expressed such concern at a meeting about SDI held by the Department of Defense for academic administrators in Washington, DC:

"This is probably the hardest technical job of the century, and it's going to be a long haul, and it's going to have to get not just the best people in the south and southwest, or the best people in the national labs, but the best people everywhere. Unfortunately," Sproull continued, "the gurus in my part of the world are discouraging a lot of the brightest young people from working on SDI."

Sanford Gottlieb, Executive Director of United Campuses Against Nuclear War (UCAM), the organization that has helped to coordinate the boycott across the country, spoke to SftP about the pledge's impact. "The SDI Organization has said that the pledge is only a few diehards. I think that they wouldn't be trying so hard to downplay it if

"I don't think SDI makes sense, but I have to say I wasn't brave enough to turn the money down immediately. I keep worrying about what I'm going to do if my research money funds run out, and believe me, they're getting harder and harder to get."

Stop Star Wars Pledge

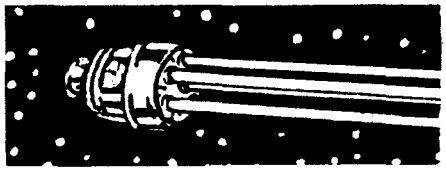
The petition reprinted below has circulated in universities across the United States:

"The Congress is at present considering a massive expansion of the Strategic Defense Initiative (Star Wars Program). It seems likely that large amounts of money will soon be made available for scientific research under the program. University-based scientists are already being invited to apply for funding under this program.

We believe that the Star Wars Program is technically dubious and politically unwise. Anti-ballistic missile defense of sufficient reliability to defend the population of the United States against a Soviet first strike is not technically feasible in the forseeable future. A system of more limited capability will only serve to escalate the arms race by encouraging development of both additional offensive overkill and an all-out competition in anti-ballistic missile weapons. The program will make arms control negotiation even more difficult than it is at present. The program is a step toward precisely the type of weapons and strategy most likely to trigger a nuclear holocaust.

For these reasons, we believe that the Star Wars Program represents, not an advance toward genuine security, but rather a major step backwards. Accordingly, as working scientists, **we will not apply for or accept support from the Strategic Defense Initiative Organization**, which funds Star Wars research. We encourage other scientists and technical personnel to join us in this refusal. We hope, together, to persuade the public and Congress not to support this deeply misguided, dangerous, and enormously expensive program."

Those interested in circulating the petition should contact John Kogut, Dept. of Physics, 263 Loomis Lab, or Mike Weissman, Dept. of Physics, 159 Loomis Lab, University of Illinois, Urbana, IL 61801.



they weren't a little worried.

"What I think they are most concerned about are two things: first, that they will be forced to fund second-rate research, and second, perhaps more importantly, they are concerned about the political battle involved. SDI is a political battle and I think its proponents are worried about how it looks to Congress to have so many prominent scientists saying that it's a bad idea and refusing to work on it."

Another important sign that the SDIO may be feeling the effect of the boycott is that some researchers have had their funding switched to SDIO grants, in several cases without any prior notice. In a case involving a researcher at Boston College, the fact that the funding had been switched came to light only through publication of the entire list of academic researchers receiving SDI funds in the Chronicle of Higher Education. As one observer commented, "It is hard to understand why SDIO would be funding projects through the back door if they had so many strong proposals, as they claim."

Negative Advertising

Despite this current controversy over switched funding sources, most organizers make few claims for the pledge having much direct impact on SDI, citing the fact that only around 5-10% of the money proposed for the project is slated for university research in the first place.

And while the pledge campaign is now beginning to make fledgling attempts to penetrate the national labs and industry, they have yet to make much headway. As one pledge organizer stated, "We are beginning to get people willing to distribute the pledge at Bell Laboratory, IBM, and some of the national labs, but it is a long way to places like Rockwell and Northrop."

According to Mike Weissman, a physicist at the University of Illinois, and one of the original drafters of the pledge, the idea to allot even 5-10% of the SDI budget for academia may have been largely aimed at building political support for the program. "I'm sure that the project directors wanted some things from academic scientists," states Weissman, "but by and large they were looking for advertising for the program.

"What we *have* done is we've turned it around. With such a large number of scientists opposing the project, we have generated a tremendous amount of negative advertising. I think that we have been very successful in reaching the general public. I know we are reaching Congress."

So while there is debate about the pledge's direct impact on SDI, there seems to be little question about the campaign's political impact. "As a gesture, it is quite eloquent and effective," says Kostia Tsipis, a nuclear weapons expert at MIT. "It shows to the public that many people who are knowledgeable about these issues feel that SDI is technically infeasible and undesirable."

Where To Go From Here

With the pledge being circulated so widely, and with a good deal of momentum built up, organizers state that they want to give it a chance to have maximum influence before taking any further action.

Scientists Against the Bomb

From Hiroshima to the Heavens

by Dan Grossman

If knowledge does not keep any better than fish, as Alfred North Whitehead once said,[1] then we should look to our recent past for precedents that can guide us through the nuclear predicaments of today.

The roots of the controversy over Star Wars research on university campuses can be traced back to World War II, when science was mobilized to win the war. World War II was a war of applied science, whose outcome was determined as much by the mobilization of science as by industrial capacity, military skill, and brute manpower. The rate of technological advance was greater than during any previous war.

After the atomic bomb was dropped on Hiroshima and Nagasaki, many scientists, especially those who had helped to build the bomb, developed a new sense of responsibility for applications of their work. The important role played by physicists in war laboratories, as well as in government, emboldened them to take part in molding the postwar world. Waves of young scientists marched to Washington to participate in hearings, briefings, and press conferences. They created the Federation of American Scientists and the *Bulletin of the Atomic Scientists* to voice their opinions on the crucial issues of atomic energy and weapons policies.[2]

But even as they articulated their new sense of responsiblity, scientists found themselves transformed into technicians in the military war machine. While Congress debated how the National Science Foundation would be structured, the Office of Naval Research (ONR) was created to fund postwar basic research. Before the war laboratories had been demobilized, the new director of the ONR traveled around the country to award grants to promising research projects.[3]

Many scientists did not want to go back to poorly equipped laboratories and pick up the research left off from before the war. They had a taste for big, expensive projects done by teams of scientists. The realization by military leaders that science was crucial to war and the discovery on the part of some scientists that the military could be an apparently benevolent sponsor of basic research dovetailed at the end of the hostilities.

Prominent Harvard astronomer Harlow Shapley remarked in 1946, "Those who were worried about domination of freedom in American science by the great industries can now worry about domination by the military."[4] Mathematician and computer pioneer Norbert Wiener publicly announced, "I do not expect to publish any future work of mine which may do damage in the hands of irresponsible militarists."[5]

After the war, pacifist A.J. Muste

Dan Grossman is a member of SftP's editorial committee and a graduate student in MIT's Science, Technology and Society program.

They stress that the pledge is still gaining support in many departments and just getting underway in others. Nonetheless, several efforts are planned to extend beyond the current pledge itself.

Whereas until now the pledge has been open only to those eligible for the SDI funds, starting this January, UCAM is planning to circulate a general petition on campuses, in response to the large number of academics in other departments who want a chance to register their opposition to the SDI program.

While supporting general opposition to SDI, David Wright worries that the distinction between a general petition and pledge by qualified scientists might become blurred. "It is important that Congress and the SDIO know that the more than 4,000 signers of the current petition are all scientists and engineers who could have applied for the research funds, but are refusing to take part in the project," he said.

In addition to the general petition, the Tufts University vote signals another direction that increased academic opposition to SDI could take, although there do not appear to be other school-wide efforts underway at this time. According to *Physics Today*, some of the original drafters of the pledge initially considered the tactic of a campus-wide ban at Cornell, but backed off because of the issue of academic freedom.

Sheldon Krimsky, in an essay published in the Tufts newspaper prior to the faculty vote, addresses this question of academic freedom forcefully, claiming that Star Wars research is "incompatible with the values and mission of universities." (See box.) But clearly, there is widespread disagreement on this issue in the academic community.

A variety of other efforts to expand the scope of the pledge include the spread of the petition abroad, to get signatures of scientists in other countries that might also participate in the research. In Canada, where these efforts are the furthest along, 750 science and engineering faculty members have signed a petition stating that SDI escalates the arms race and violates the 1972 ABM Treaty. In addition, individual petitions at the University of Toronto and McMaster University have reportedly attracted 450 and 650 signatures respectively.

Professor Schwartz, of U.C. Berkeley, is also taking his own major step beyond the pledge, following a proposal he formulated last year, calling upon his colleagues in physics to refrain from teaching unless the arms race begins to reverse itself. Starting at the beginning of the next academic year, Schwartz will refuse to teach the department's regular physics courses which train physicists and engineers for the profession. Instead, the department has agreed to let him teach science and society courses, and some physics courses that are geared primarily for nonphysics majors.

As Schwartz states, "The reasons for my action are several. They have to do with my deep feelings about complicity in an establishment that is geared for war, where the vast majority of jobs are weapons related, and where scientists are the frontline soldiers in line for the war effort. Personally, I do not want to collaborate further in such an establishment.

"Most of my colleagues think that what I'm doing is strange, or perhaps just uninteresting, but I feel a very strong conviction about it. In this effort, I am denying the idea that science is neutral. And I am trying to confront these issues in a personal way."

unsuccessfully called on leading scientists to refuse to work on atomic weapons.[6] In 1954, a call for a work stoppage to protest the treatment of Robert Oppenheimer, who had been censured as a security risk to the nation, was also unsuccessful.[7] In each case, prominent researchers involved in defense research, such as Hans Bethe and Vannevar Bush, opposed the actions.

During the 1950s and early 1960s, the federal commitment to university-based military research and development continued to grow. Scientists gained influence in Washington as advisors on military technology. Simultaneously, a new breed of scientists emerged, epitomized by Jerome Wiesner—later science advisor to President Kennedy—who were committed to both a strong national security and to arms control. The International Pugwash organization was formed as a forum in which such influential scientists from the east and west could meet in an unpolarized atmosphere.

During the late 1960s and early 1970s, the opposing views of science, as a socially responsible activity and as a tool in the service of the military, clashed as scientists became disenchanted with the Vietnam War, the proposed Anti-Ballistic Missile system (ABM), and other perceived misuses of science. Senator Mark Hatfield remarked:

> The universities, by becoming inferior, contracted members of the defense establishment can only increase their participation as the intellectual advocates and architects of the war machine. It is my contention that the efforts to examine the debilitating effects of the defense establishment, not only upon society as a whole, but also upon the university itself, are steps towards the reintroduction of human ideals into what is now policy formed mainly by economic considerations.[8]

University scientists from around the nation spoke out against an ABM system which would have required the basing of nuclear armed weapons near ten of the largest cities in the country.[9] Two hundred physicists presented a petition to the president, with 1100 signatures opposing the ABM.[10]

The ABM was a weapons system that, like SDI, appeared to be flexible enough to fit almost any justification. At various times, its proponents described the ABM as a defense against Soviet missiles or future Chinese ones, a defense of U.S. cities, or a defense of key strategic sites, such as ICBM fields and command and control posts. Edward Teller, credited with convincing President Reagan to support SDI, was also a vocal advocate of the ABM.

As in today's controversy, most of the critiques of the ABM were technical. Noam Chomsky warned against overemphasizing these in 1969:

> Such discussion is perhaps somewhat beside the point, for two reasons. First, the ABM may be even more dangerous if it does work than if it does not. Hubert Humphrey recently pointed out that if the ABM "does achieve an effective missile screen it could release policy-makers from the restraints imposed by enemy second-strike capacity"—no small consideration in a country as devoted to international violence as ours. Second, the motivation for the ABM is largely political and

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MOVING TOWARDS INDEPENDENT AGRICULTURE

Nicaragua Struggles in the World Economy

by John Vandermeer

As a member of the New World Agriculture Group, I have traveled to Nicaragua many times since 1980 in the capacity of teacher, advisor, and researcher.

I've been able to witness, personally, not only their plans for agricultural development, but also the successes and failures of those plans, to the extent they have already been realized. The attitude of the Nicaraguan government towards science and technology is not the western attitude so frequently criticized in the pages of this magazine. On the other hand, it is by no means a rejectionist, back-to-nature anti-science. In my judgment, it is a new model of science and technology, clearly influenced by the kind of analyses radical scientists have been attempting for the last twenty years, but also heavily influenced by concrete Nicaraguan realities.

This article attempts to analyze Nicaragua's model for science and technology—its theory and practice, its successes and failures. To fully appreciate the roots of this model, and Nicaraguans' hopes for future development, it is necessary to understand Nicaragua's role in the world economy. So this article begins with an overview of the impact of the world economic system on Nicaragua.

John Vandermeer teaches ecology and biology at the University of Michigan. He is active in the New World Agriculture Group and the Farm Labor Organizing Committee, and is a longstanding member of SftP. He also edited the book The Nicaragua Reader.

Global Economic Structures

Advanced industrialized capitalist nations are characterized by an essential tension between capitalists as entrepreneurs and capitalists as members of a social class. On the one hand, they are forced to minimize labor costs in the production

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process. On the other hand, they hope for prosperity among the working people so that their products will find lucrative markets. Herein lies the essential contradiction: wanting to pay the workers as little as possible, as entrepreneur, and wanting to pay the workers as much as possible, as member of a social class.

A balance between these two forces is theoretically possible, but that balance is usually quite unstable, resulting in what political economists term a crisis. Sometimes, the social class membership role may dominate, leading to temporarily high wages, low unemployment, and inevitable inflation. Other times, the entrepreneurial role may dominate temporarily, leading to lower wages and an underconsumption crisis known as stagnation. More commonly, imbalances are realized differently in different economic sectors, resulting in more complicated, though equally severe, crises.

These crises are accompanied by the threat of social turmoil and political upheaval, and should be avoided, from a social welfare point of view. Even from the narrower point of view of the capitalist as entrepreneur, stagnation, recession, and economic depression are as bad for the capitalists' profits as they are for the workers' pocketbooks.

An escape valve is absolutely necessary if the system is to persist over the long term. Social turmoil and political upheaval must be stifled, and profits must be gained during the inevitable periods of crisis. At this juncture, the function of the third world is most clear. The third world acts as the safety valve for the economic crises of the capitalist world.

Most third world countries in Latin America have an underlying capitalist ideology and pay almost religious homage to the notion of a free market. But the contradiction of industrial world capitalists (as individual entrepreneur as well as member of a social class) is not a pervasive problem in third world economies. Instead, two economic sectors tend to dominate—the export sector and the traditional

sector. The critical difference is that these two sectors are unconnected, or only weakly connected.

The traditional sector encompasses the majority of people, the small farmers. They are characterized by a fluid participation in the working class. For example, Carlos, a Costa Rican friend of mine, farms about one hectare of land. He grows corn and beans, which rarely yield anything, cassava, and other root crops, which are the starch staples for his family. He also owns a cow and numerous chickens. His family survives on eggs, milk, and root crops, plus occasional fish, captured game animals, or other bartered food. Carlos just got a job as a night watchman. He works eight hours a week for $.50 an hour. When I asked him how he liked working, he said, "At least I won't forget what money looks like."

Carlos, like countless small farmers all over Latin America, is accustomed to surviving on a life of eggs, milk, and root crops. He may not like it (he doesn't, by the way, in case any reader is tempted to find such a diet romantic), but he can live on it.

The importance of the traditional sector to the solution of crisis is its fluidity. Carlos can be called upon for wage work when a North American company finds it profitable to produce flowers in Costa Rica because investment opportunities in the U.S. are bleak, due to a crisis there. When investment becomes more favorable in the U.S., the flower operation can easily be shut down in Costa Rica, and Carlos can feed his family on the eggs, milk, and root crops from his farm. No social turmoil, no political upheaval, and the problem of the crisis has been solved for the North American capitalist.

The second sector in Latin America's third world economy is the export sector. Though it's not connected to the traditional sector in terms of commodity markets, the two sectors do share the need for a labor force. The export sector's primary connection, instead, is to the industrialized world.

A cotton farmer in Guatemala, for example, buys seed, fertilizer, and pesticide from foreign corporations (usually U.S.), grows cotton using local labor (borrowed from the traditional sector), and sells the cotton to an export company (again, usually U.S.). Note that the entrepreneurial/social class contradiction faced by the industrialized world capitalist is foreign to the third world export capitalist. The latter is concerned with minimizing labor costs on the farm, but not with the social question of elevating the purchasing power of his workers.

This contradiction may be a driving force for development in the first world, but a similar force does not exist in the third world. Thus, the unconnected nature of the third world economy persists, and serves its function as an escape valve for the developed world.

Free Nicaragua threatens the U.S. system in the same way that the ideas of abolitionists threatened the southern plantation system.

Understanding this international economic structure helps to clarify Nicaragua's development goals, and explains why the U.S. cannot accept those goals. Nicaragua is attempting to connect the two sectors of its economy, relieving the burden that the export/traditional structure imposes.

Presently, the U.S. uses about 45 Latin American countries as economic escape valves. While Nicaragua alone presents little challenge to the whole international economic system, if all 45 of those Latin American countries were to develop the same attitude, the U.S. would loose most of its crisis-solving apparatus. This is the threat that Nicaragua poses to the U.S.

While it is absurd to claim that Nicaragua is a military threat to the U.S., it is equally absurd to claim that no threat exists. Free Nicaragua threatens the U.S. system in the same way that the ideas of abolitionists threatened the southern plantation system.

Nicaragua's Economic Development

Nicaragua developed as a classic dependent economy, perhaps the most dependent in all of Central America. The original extensive haciendas which developed under Spanish colonialism created the base for a powerful oligarchy, similar to those in Guatemala, El Salvador, and Costa Rica.

The 1920s and '30s marked a period of liberal reform throughout Central America, in which the unquestioned hegemony of the traditional oligarchy was challenged by a new oligarchy, based economically on the expansion of coffee as an export crop. While Guatemala, El Salvador, and Costa Rica developed rapidly in this regard, Nicaragua was effectively squelched by the presence of U.S. occupation forces. Nicaragua's strategic position as a possible canal site induced the United States to take a very conservative stance there. U.S. Marines, and later the National Guard under Somoza, stifled most of the liberal changes that might have otherwise occurred.

While the new coffee oligarchies grew to dominate Guatemala and El Salvador, the uneasy stalemate between the traditional and modern oligarchies persisted in Nicaragua, under the watchful eye of the U.S. military, throughout the 1940s and '50s. The fifties witnessed the expansion of a new component of the export sector, cotton.

A series of international economic events, coupled with the availability of a new technology, petrochemical insecticides, resulted in the massive growth of cotton production in Guatemala, El Salvador, and Nicaragua. Cotton, even more than coffee before it, required the export sector to be intimately connected to the dominant countries of the developed world.

At the time of the 1979 revolution, the production processes and flow of import, export, and consumer goods were typical of an unconnected economy. The export sector had virtually no connection to the other sectors of the economy, but had most of its organic linkages with external markets and suppliers, causing a dependent relationship.

Such dependency in a third world context almost always leads to unfair terms of trade, in which supplies for production, such as seeds, fertilizer, and pesticides, must be purchased at rapidly inflating prices, whereas the export products, such as cotton and coffee,

must be sold at slowly inflating prices. Nicaragua was no exception, floundering economically from worsening terms of trade.

Since the victory of the Sandinista revolution in 1979, the economic structure has changed considerably, if not in fact, at least in plan. The short-term plan for transforming Nicaragua's agrarian economy involves the same sectors of people—capitalists, working people, and traditional small farmers—but the composition of the three sectors is changing rapidly. The capitalist sector is no longer occupied by a small, privileged minority. Instead, small farmers are being brought into this sector, usually through farm cooperatives for coffee export. The number of rural workers is also increasing on state farms.

The biggest economic changes will occur in the export sector. The country's productive capacity is aimed at connecting the unconnected economy to imports and producers. Production will result not only in exports like cotton, but also consumer goods like textiles, and capital goods, like pesticides.

It is in this context of connecting its unconnected economy that science and technology are developing in Nicaragua. Production can no longer be imported solely from the industrialized world. Local science and technology will be developed to feed such sectors as cotton and textile production.

Transforming Nicaragua's Economy

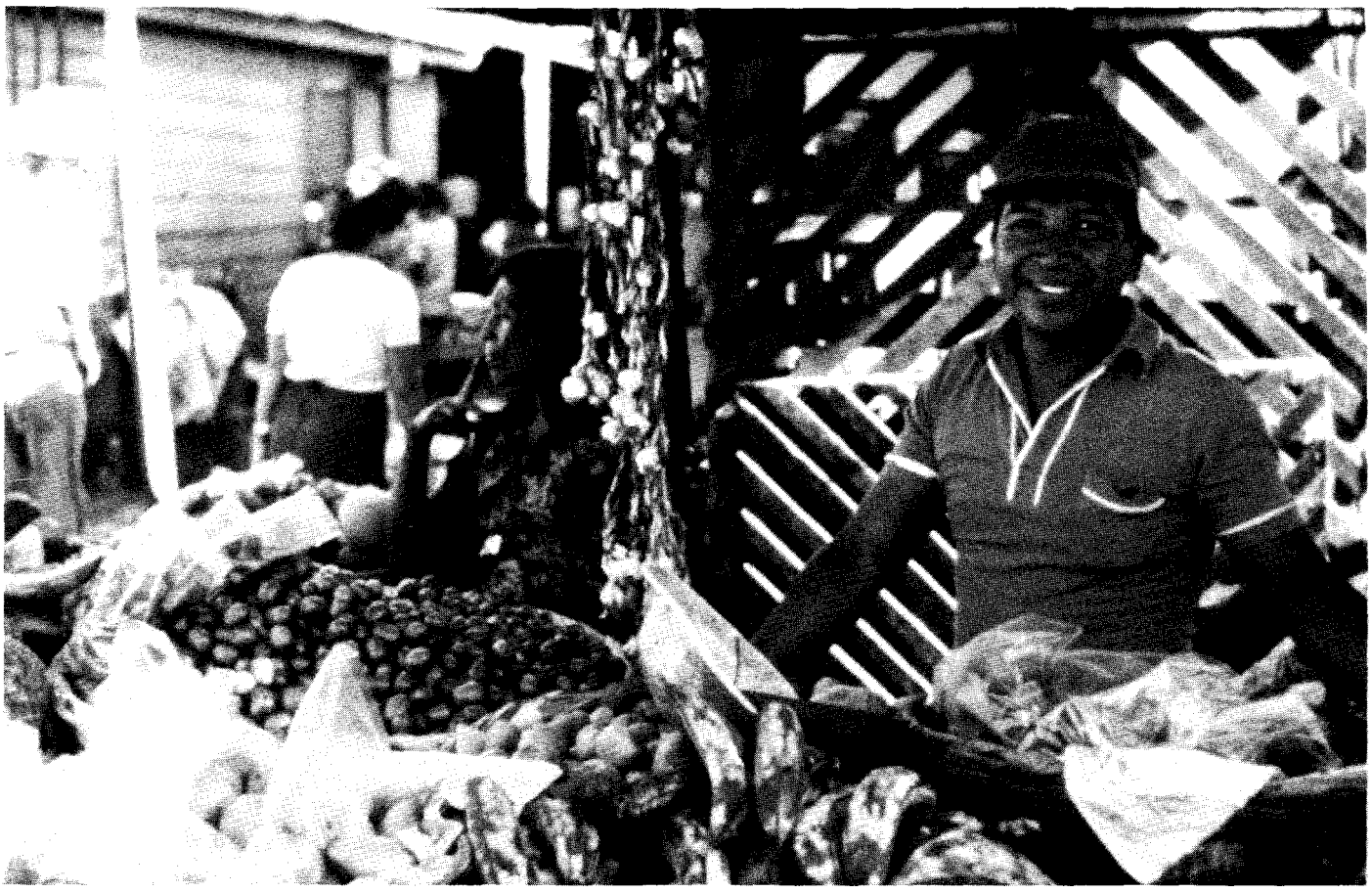
An assessment of Nicaragua's successes is much more difficult than a presentation of its abstract goals. Their strategy is to build a new economy that substitutes Nicaraguan materials and knowledge for imported capital goods, and produces commodities for both export and national consumption, thus breaking economic dependency. But all of this is to be achieved in an ecologically sound manner, sustainable on a long-term basis.

The pathway to independence had to begin with the economy inherited from the oligarchies—an unconnected, dependent economy. Realizing that the export sector was the only short-term possibility for foreign exchange, all plans emphasized the increased efficiency of export production. That is, the dependent connection must first be broken at the import level, maintaining or expanding export markets for the major products, especially cotton and coffee, but also beef, sesame, sugar and bananas.

At the same time, to avoid new export earnings being eaten up by food imports, the production of basic necessities had to be increased. It was this latter necessity that helped fuel the move towards agrarian reform—the major impetus having been the promise of the revolution itself. Former rural workers would produce those basic necessities on newly-acquired farms.

But a second aspect of land tenure change is equally important. If newly-landed small farmers were to produce the necessities for domestic consumption, they had to be assured that it would be profitable to do so. Yet the provision of food for everyone is a basic goal of the revolution, and requires low food prices.

This clearly contradictory situation is faced by most agricultural economies. Its resolution requires subsidies. In principle, either farmers have to be paid to produce at a loss, or consumers have to be paid to purchase food at prices that are higher than they can afford. Whether such subsidies are paid by low interest loans, food credits, or rationing, they amount to the same economic burden at a social level.



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Revenues from somewhere else in the economy are needed to provide those subsidies.

Considering the inherited form of Nicaragua's economy, the only source of that revenue was the export sector. Thus land tenure change also had to protect and promote production in the export sector. This was accomplished by expropriating all lands belonging to Nicaragua's former dictator Somoza and his associates, and turning them into large, efficient state-run farms. In addition, other large producers had to be assured that as long as they continued production, their assets would not be subject to confiscation by the new Sandinista government.

The overall program of agrarian reform planned to distribute land to small producers (either as individual small farmers or cooperative members) for the production of cheap food, subsidized by revenues from export production that was carried out by state farms and large private estates.

Statistically, the biggest change in land ownership came right after the revolution, when 41% of the farms over 850 acres were immediately expropriated. This was land that had belonged to Somoza and his associates, and most of it became state farms. Thus, almost 60% of the largest farms were left in private hands, with assurances that, as long as production was maintained, private ownership would not be violated.

The other major change wrought by agrarian reform is the amount of land redistributed to small producers, frequently organized into production cooperatives. As of 1984, almost 12% of Nicaragua's national territority was in the hands of small producers. Of the 59% of the land in farms of less than 345 acres, 14% are production cooperatives, and 18% are credit and service cooperatives.

Changes in Production and Consumption

Have these changes in land tenure accomplished their goal? Production and consumption of most basic items is up, although some anomalies suggest problems. For example, egg production increased 284%, but consumption remained at pre-revolutionary levels, or even declined. But generally, the provisioning of basic food items has been relatively good, with beef and milk production sagging, and rice and chicken consumption well above pre-revolutionary figures.

On average, current production of basic items is 149% of pre-1979 production, while current consumption has risen 112%. The lower figure for consumption is mainly a reflection of cuts in formerly imported food items, but on balance these figures are remarkable in the face of the economic and military pressure imposed upon the country.

But the fate of export production seems quite bleak. While cotton production in 1983 was only 63% of its pre-revolutionary level, coffee production rose to 125% and sugar was 112% of production before 1979. But the level of production is the least important aspect of export agriculture. The price of the commodity and the relative value of the currency obtained are much more important.

Taking inflation and price changes into account, the effective export earnings in 1983 were only 65% of their pre-revolutionary amounts. And that figure is likely to decline further, as the world economic situation continues to deteriorate. For example, the 1984 projections indicate that Nicaragua's sugar harvest, while equal in tonnage to the 1983 harvest, only brought in $9,979 in 1978 dollars, representing only 53% of the pre-revolutionary value.

In general, the overall picture reflects exactly what one would expect from a poor agro-export economy performing quite well internally, but faced with an impossible international economic situation. The production of basic necessities has been maintained and even increased, despite $204 million worth of damage to Nicaragua's productive capability due to the *contra* war. The production of export crops, and consequently the ability to continue subsidies to the production of basic necessities, is floundering.

The international economic order would still hinder development, even without the war, if Nicaragua relied on normal modes of export production as their principle source of investment capital. Exports would have to increase by $221 million just to reach parity with the value of pre-revolutionary exports, at which time there already existed a $98 million trade deficit.

To actually balance the 1983 budget would require an increase of $408 million—a 99% increase in export earnings. Even if the war were to stop tomorrow, an increase of $139 million in foreign exchange (a 34% increase over the present rate) would be required just to reach parity with pre-revolutionary figures, and a 79% increase, or $326 million, would be needed to balance the budget.

Connecting the Unconnected Economy

To become independent, Nicaragua must not only increase its export earnings in traditional commodities, but change the exports themselves. Nicaragua has initiated a variety of

projects that eventually will create "value-added" processing for its own raw materials — to export thread instead of cotton, fabric instead of thread, and then blue jeans instead of fabric.

For example, a large vegetable producing and processing facility, financed by the Bulgarian government, is nearing completion. It will first satisfy Nicaragua's internal demand for canned vegetables, and ultimately export them to Eastern Europe, the Middle East, the Central American Common Market, and the Caribbean.

Many other projects are underway, designed to export processed, rather than raw, materials. The first thread factory is scheduled to open this year, a step towards developing a textile industry. On Nicaragua's Atlantic coast, the new African Oil Palm project will initially meet internal demands for cooking oil, and later provide industrial input for oil-based products, which can be exported. The new massive sugar mill, the largest in Central America, will provide sugar for export initially, and possibly chemical feed stock for the development of a chemical industry.

At the other end of the production cycle, the import of capital goods is equally important. Here, too, Nicaragua has many plans. Their internationally acclaimed cotton pest management program substitutes biological methods for imported pesticides. Similarly, the Ministry of Agriculture has a plan for producing *Bacillus thuringensis*, a bacterial insecticide, using Nicaraguan materials that will replace imported pesticides and serve as a biological pesticide export for other Central American countries. Also, a program for seed production is underway, reducing dependence on imported seed stock for basic grain production. These projects will make Nicaragua less dependent on imports.

Nicaragua's short-term plan is to feed all its people and generate development capital from their current export agriculture, and its long-term plan is to break the links of dependency and internally connect its unconnected economy. While they have been partially successful in their first goal—everyone eats, but there is no capital for investment—they are well on their way towards meeting their long-term goal. It is their emphasis on this second goal that makes them such a threat to Washington.

"The smell of insecticide the smell of Nicaragua"

Ernesto Cardenal

There is a great deal of truth to Ronald Reagan's assertion that if the Nicaraguan revolution is not broken, it will spill over into neighboring countries. There is also truth to the Reagan administration's admonition that Latin American revolutions threaten our system. Loss of a single satellite, such as Nicaragua, is not very significant. But loss of of a few dozen satellite countries would cause a crisis.

We will never see a healthy economy, middle class lifestyles, *and* an independent Latin America. Dependency in Latin America and a healthy economy in the U.S. are organically linked.

U.S. capitalism needs Latin American land and labor as much as our southern plantations needed slavery. So any change in economic relations with Latin America requires changes in the U.S. We cannot ask for Nicaragua's independence, or that of the rest of Latin America, and ignore the need for structural reform at home.

Environment and Agriculture

A walk through the cotton fields of Leon Province or the vegetable farms of the Sebaco Valley reminds one that the legacy of the Somoza years lingers, a landscape so saturated with pesticides that the famous Nicaraguan poet, Ernesto Cardenal, was moved to write,

The smell of insecticide
the smell of Nicaragua.

Nicaragua's environmental problems remain severe, despite remarkable gains made in the last five years. These problems have been caused by over-use of pesticides, soil erosion, and the war.

The over-use of pesticides is not something that can be solved simply by not using them. Like addicting drugs, their use frequently creates the need to use more. The target pest species develops resistance and requires more and heavier applications for the same effectiveness. Non-pest species suddenly become pests because natural enemies are destroyed by the pesticides. Such a treadmill was operative during the Somoza years, and the Sandinistas are now faced with the need to spray because of that legacy.

Soil erosion is not as well-publicized, but probably an equally important problem. Last year, when I made a presentation before the technical commission of Nicaragua's Ministry of Agriculture, I showed a slide of a dust storm during the famous dust bowl of the U.S. southwest. One of the vice ministers told me later that he thought I was showing a slide taken in eastern Nicaragua. The vast acres of cotton land on the eastern seaboard, especially in the provinces of Chinandega and Leon, are green and productive during the wet season, but dry and blown away during the dry season. It is a problem of major proportions.

The war being waged against Nicaragua is the third, and perhaps most devastating, agricultural problem. Agricultural production facilities are regular targets of U.S.-supported *contras*. Last year, exactly at the critical time when the locally-concentrated bollweevil had to be sprayed in the integrated pest control program, the *contras* burned down the warehouse that held the approved pesticide. It was thus necessary to use the old stocks of DDT that were confiscated after the revolution, to avoid losing the integrated control program.

Entire agro-ecosystems have been effectively destroyed due to the war. Much of what had been traditional grain-producing area is no longer productive due to combat, thus threatening Nicaragua's commitment to food self-sufficiency. Because these areas no longer produce grain, Nicaraguans may soon see severe food shortages. Because of massive wind erosion, the ecological base of the country is being lost. Because of the misuse of pesticides, much of the land is already poisoned.

AUTOMATION MADNESS

Progress Without People

by David F. Noble

When we look past the veil of mystery that enshrouds the work of technical people, we find that their activities reflect their relation to power at every point.

Their link with power gives them power—it entitles them to practice their trade in the first place, to learn, to explore, to invent; it emboldens their imagination; and it provides them with the wherewithal to put their grand designs into practice. In short, it is the support of those in power (in our society, those with money, or those with political, military, or legal authority) that affords technical people the luxury to dream, to dream expansively (yet within well understood limits), and to make their dreams come true (by imposing them on others).

Although most scientists and engineers would admit to their dependence upon those with power, few would concede that this relationship actually influences the way they think about things. They would insist, rather, that they are guided in their work by technical considerations above all else, and that this is what makes their calling rational and thus compelling. Moreover, judging from my own experience working with and teaching technical people, I know that few engineers are deliberately out to destroy jobs or unions, or to harm people in any way.

Although, of course, in practice they must satisfy the requirement of their boss, their client, or their customer, ultimately they aim only to do the best work for the good of society. Yet, consistently, again and again, they turn out solutions that are good for the people in power (management) but often disastrous for the rest of us (workers). Can this be explained?

For one thing, few technical people have any contact whatsoever with workers; in their education and their professional careers, they typically communicate only with management. Not surprisingly, they tend to view the world pretty much as management does, whether they know it or not. They are taught, and usually believe, that this is simply the most objective way of looking at things. But it is, in reality, the view from the top, the perspective of those with power.

> "If they have the right to say yes to technology and then move, we have the right to say no and prevent them from moving; that's equality."

Behind the Technical Screen

To illustrate, let me cite one example from my teaching experience in the MIT engineering school. All the students were graduate engineers, quite talented and well meaning. One year they had a project to study the hazards involved in the transportation of Liquified Natural Gas (LNG) by truck throughout New England. LNG is a highly volatile and extremely flammable substance. If it escaped from the tanks in an accident it would ignite immediately and cause tremendous damage.

So the students set out to examine this problem in depth, and they did a very thorough, indeed exhaustive, job. They studied all the technical aspects of the problem, the engineering of the containment, the practical problems of loading the trucks, the scientific problems of the diffusion of escaping gas. And, to do this, they spoke with nearly everyone involved—the shippers, trucking companies, local, state, and federal regulatory officials. They would have contacted the suppliers in Algeria if they had found it necessary.

Yet, at the study's end, they had totally ignored those people most directly involved—namely, the drivers of the trucks. They were readily accessible; they belonged to two unions which had local offices in the city, with listed phone numbers. Yet the students neglected to contact them. Why? This was not intentional. But it was not really an oversight either. It was ideological. For the engineers, the workers were an alien species on another planet; they were not in the same world as the engineers, managers, or officials. It would have taken a tremendous leap of imagination and, indeed, an act of courage, for them to have crossed over the class line.

David Noble teaches in the department of history and philosophy at Drexel University. He was formerly the curator of industrial automation at the Smithsonian and professor of the history of technology at MIT. He's also the author of America by Design *and* Forces of Production, *and a member of SftP's editorial advisory board.*

This article was derived from a series of talks presented to labor audiences in the U.S., Canada and Europe. The Metropolitan Labor Council of Toronto will publish the complete essays as a pamphlet in mid-1986. A collection of Noble's articles, "Smash Machines, Not People!": Fighting the Management Myth of Progress, *will be published by Singlejack Books in May.*

Not surprisingly, the perceptions and insights of the workers were missing from the study report, which naturally evolved—without any instruction—into a management document. Engineering education is like this. Engineering students are encouraged at every turn to identify with, emulate, and serve those in power and either to ignore or to manipulate all others.

A second example illustrates where this training leads. For seven years I investigated the history of automated machine tools. Much of the pioneering design and development work took place at MIT, and I spent many months poring over the vast collection of documents from the 10-year project. I discovered that the engineers involved in creating this self-professed revolution in metalworking manufacturing had been in constant contact with industrial managers and industry officers who sponsored and monitored the project.

Yet I found not a single piece of paper indicating that there had been contact with any of the many thousands of men and women who work as machinists in the metalworking industry—those most knowledgeable about metalcutting and, again, those most directly affected by the technical changes under development. Again, and for the same ideological reasons, the engineering effort was essentially a management effort, and the resulting technology reflected this limited perspective—the world view of those in power.

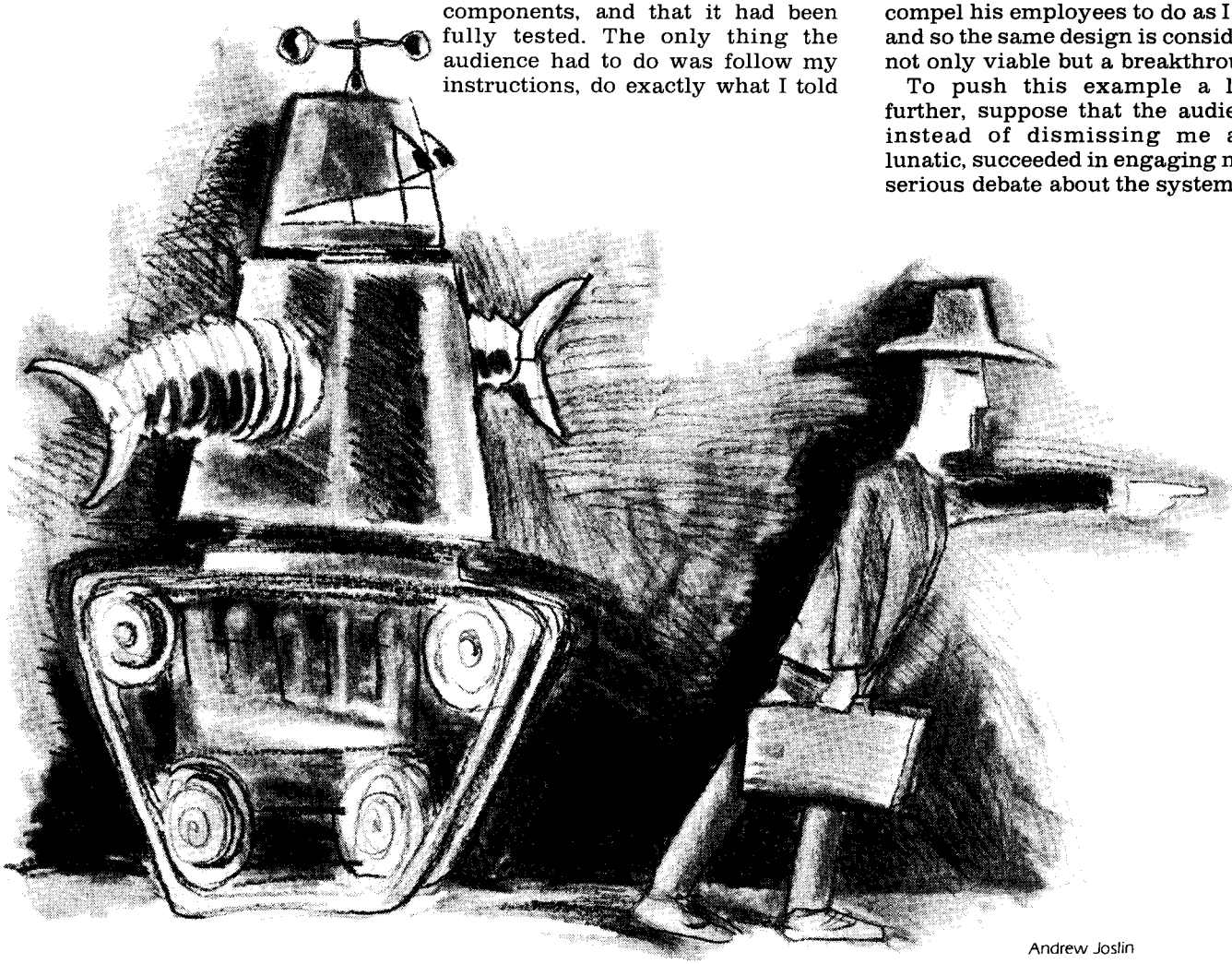
Clearly, this closed world of technical people affects the way they think about things. From the outset, they consider only those solutions which are compatible with power. Again, this assumption of power in the minds of engineers is rarely conscious, nor need it be. Exactly how it works to keep them on track is subtle but powerful, for it relies upon their own desires for recognition and power.

Let me illustrate. Suppose I were giving this talk one day and announced to my audience that I had developed an ingenious new technical system which would enable the audience to produce some indgit in half the time it takes conventionally, that it included the latest, state-of-the-art components, and that it had been fully tested. The only thing the audience had to do was follow my instructions, do exactly what I told them for as long as I said. That is, a central operating feature of the system's design was that it gave me complete control over everyone else's activities.

And suppose I was quite enthusiastic about this system and got very excited trying to convince the audience—insisting upon my right to make all of the decisions. Pretty soon, they would think me some kind of nut and perhaps show me the exit. Yet, such systems are designed and sold every day. If I were to take that exact same design to Lee Iacocca or Henry Ford, or any top manager in industry, chances are they would consider me a genius, buy the system, and hire me to implement it. What exactly is the difference between the two situations, such that with the same invention, in the first case, I would be ridiculed, and in the second, hailed as brilliant?

The difference would be the relations of power. In the first instance, I do not have the power to get the audience to follow my instructions, so my design seems absurd. In the second case, however, the executive knows that he could compel his employees to do as I say, and so the same design is considered not only viable but a breakthrough.

To push this example a little further, suppose that the audience, instead of dismissing me as a lunatic, succeeded in engaging me in serious debate about the system and



Andrew Joslin

that, after a while, we had together worked out a compromise design which was satisfactory in every way but gave everyone equal say-so—a democratic design, so to speak.

Now if I took this improved (and more challenging) design to the executive, he would be the one to dismiss it as absurd—what, a system that gives workers the same decision-making power as a manager? Nonsense. What are you, some kind of radical? The point is this: that the viability of a design is not simply a technical or even an economic evaluation, but rather a political one. A technology is deemed viable if it conforms to the existing relations of power.

Engineers are not stupid people. However naive they might be about some things, they learn quite early on that in our society, the authoritarian pattern predominates in all institutions and workplaces. (Workplaces are either run autocratically by the boss or are governed by labor contracts which give managers exclusive control over production and technical decisions.) So when an engineer begins to design a top-down technical system, he or she reasonably assumes from the outset that the social power of management will be available to make the system functionable.

Such authoritarian systems are also simpler to design than more democratic ones, since they entail fewer independent variables. This makes them more appealing to designers. Finally, authoritarian systems satisfy the engineer's own will to control, and offer the engineer a powerful place in the scheme of things.

Thus, for all these reasons, new technical systems are conceived from the outset as authoritarian ones. With little forethought and no malice to speak of, engineers routinely draw up designs and construct systems which concretely reinforce the power of those they serve. In the process, their own interests, ambitions, and compulsions become intertwined with and indistinguishable from those of their patrons, and these shared fantasies of omnipotence shape what they do. Never are all possibilities entertained and soberly evaluated, as the Darwinian idea of technological progress suggests, but only those which are compatible with the authoritarian position and disposition of those with the power to choose.

When I studied the history of industrial automation, all of this became very clear to me. I found that, while technical and economic considerations were always important, they were rarely the decisive factors when it came to what was ultimately designed and deployed. Behind the technical and economic rhetoric of justification, I consistently found other impulses: a management obsession with control, a military emphasis upon command and performance, and enthusiasms and compulsions which blindly fostered the drive for automaticity.

The Market Mirage

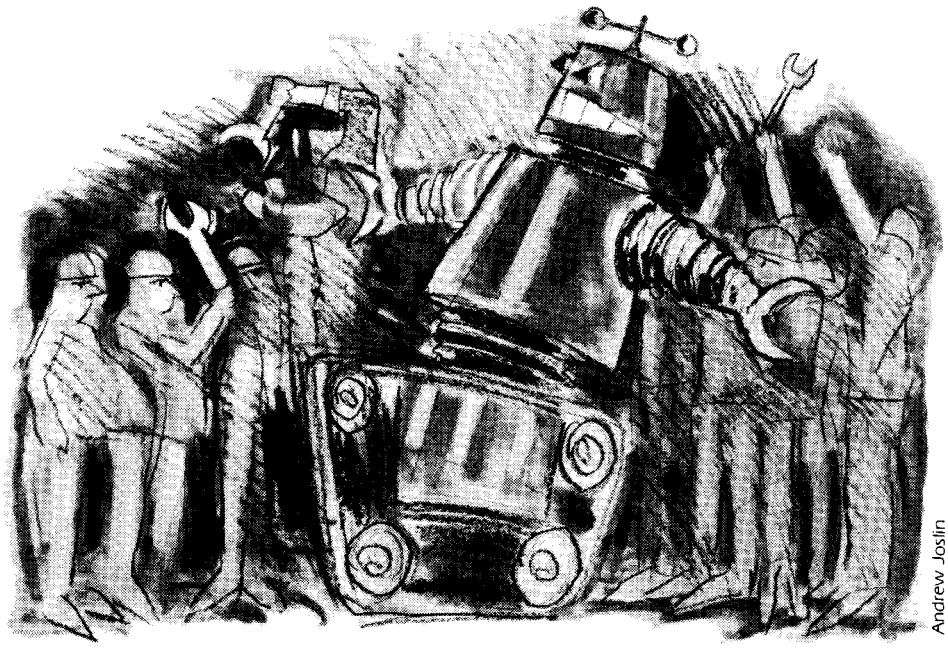
If you can't trust the technical people, and you can't trust the businessman, who or what can you trust to keep technological progress on course? Happily, there's still the market, that mysterious yet infallible machanism which magically makes everything work out in the end.

Just as it miraculously transforms the individual pursuit of self-interest into the larger social good, so the market consistently corrects for the excesses and errors of individual businessmen by forcing them into bankruptcy and out of the picture. Only the sober, smart, and savvy survive and thus, finally, in this competitive court of last resort, our Darwinian assumptions of natural selection are upheld. Not quite.

The convenient fiction of the market was a nineteenth century propaganda invention created by upwardly-mobile bourgeoisie to challenge the economic power of the state and thereby extend the range of their exploitation.[1] In reality, the "free" market has never truly existed, because businessmen have always used all the political power at their disposal to influence events in their interest: they used the state to create the "free market" in the first place by doing away with regulations protecting workers and consumers. They enacted all sorts of protective devices for themselves, from state-chartered and subsidized corporations and tax incentives to military support of enterprise and, of course, tariffs.

And the same is true today, where the role of government in the economy is greater than ever before. The supposedly self-regulating mechanism of the competitive market is easily overwhelmed by the power of the state as both underwriter of enterprise and largest customer.

In the case of automation, as we have seen, the state, especially the military, has played a control role. Not only has it subsidized extravagant developments that the market could not or refused to bear, but it absorbed excessive costs and thereby kept afloat those competitors who would otherwise have sunk. As one Air Force official candidly observed:



Andrew Joslin

"We have contractors with divisions set up just to get Air Force projects. We're keeping them alive. People are automating for automation's sake in several cases. There is no good reason, there is no good justification—and in fact it may be detrimental. We work with companies whose job it is to implement these advanced technologies, and if they can get a project from the Air Force, regardless of its real payback, they keep in business."[2]

It is thus no accident, for example, that the machine tool builders' trade association moved its headquarters from the midwest center of its industry to Washington, D.C., home of its major customer, the Department of Defense. Nor is it an accident that the defense-related industries are the ones with the most automation. These industries, moreover, are expanding along with the military automation programs, as more and more businesses rush to this state-supported sanctuary to escape the unpredictable vicissitudes of the market.

At the same time, the military automation programs are today being matched by those of civilian agencies such as the Department of Commerce, the National Science Foundation, and others. All have now become the publicly-funded pushers of automation madness, charting a course and prompting a pace that no self-adjusting market, had it existed, would ever have tolerated.

And where the state fails to provide safety from competitors, monopoly succeeds. The economic power of gigantic multinational corporations, some of which exceed the scale of governments, allows managers to carry costs, and conceal costs, that would cripple other firms. And their sheer economic (and thus political) muscle enables them to corner markets, intimidate or "acquire" competitors, and thereby distort beyond measure the real costs of doing business.

And the relationship between corporate profit and economic production is becoming more incidental every day. The corporate automation drive is just one case in point. Not surprisingly, it is the giant firms which are the leaders in this drive and it is difficult, if not impossible, to evaluate their returns. General Electric (G.E.) is a prime example. It is also a major, and heavily subsidized, defense contractor, like many giant multinational manufacturing companies.

G.E. decided several years ago to become the "world supermarket" for automation equipment, the largest supplier of such industrial machinery. With this strategy in place, G.E. accelerated the introduction of its automated equipment within its own factories. At each location (Louisville, Erie, Schenectady, Lynn) and in each product division (appliances, locomotives, turbines, aircraft engines), the company insisted that it had to automate to stay competitive, despite the loss of jobs.

But how much of this effort is really a marketing strategy to sell its equipment to other companies? By making some of its own plants showcases of automation (and absorbing the costs elsewhere in the corporation), G.E. kills two birds with one stone. The company intimidates the unions into concessions and acquiescence to job loss, while at the same time it holds up these shiny robotized plants as examples of the factory of the future in order to sell more equipment.

The company's powerful position in all of these markets, its ability to shift costs internally, and, of course, its ample state support all guarantee its continued survival and prosperity—despite the half-truths about competition presented to the unions at contract time, and whatever the actual costs and benefits of automation are.

Thus, the market panacea turns out to be just one more mirage that evaporates upon closer inspection. No automatic guarantor of economically sound technological progress, it is instead yet another

ideological camouflage for political power. Perhaps it is time now to leave Darwinism to biology, where it belongs, and to start looking at this important matter of technological progress more critically, because it has serious consequences for us all.

A Second Look at Social Progress

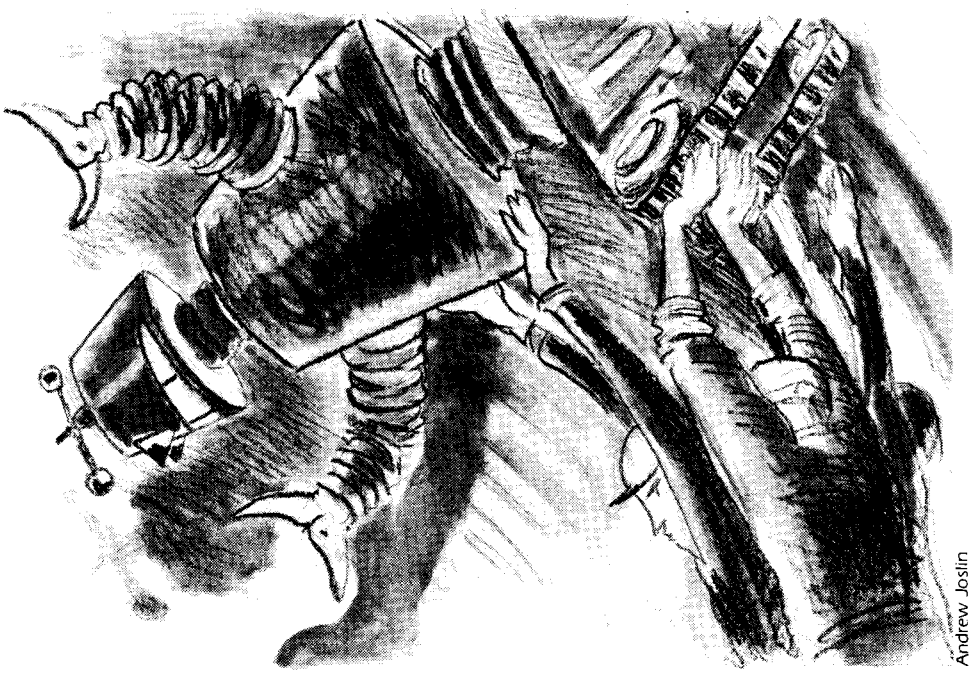
Thus far, the consequences of automation for workers are no cause for optimism. The loss of income relative to output, the constant 40 hour work week, and the rising spectre of unemployment do not create a promising picture, as Leontieff (one of the few economists with the courage to tell it as it is) has explained:

> "[The] value of capital stock employed per man-hour in manufacturing industries in the U.S. ... has almost doubled since the end of World War II.... Since the end of World War II, however, the work week has remained almost constant.... Concurrently, the U.S. economy has seen a chronic increase in unemployment from one oscillation of the business cycle to the next. The 2 percent accepted as the irreducible unemployment rate by proponents of full-employment legislation in 1945 became the 4 percent of New Frontier economic managers in the 1960s. The country's unemployment problem today exceeds 9 percent [1982].... Americans might have [absorbed] potential technological unemployment by voluntarily shortening the work week if real wages had risen over the past 40 years faster than they actually have.... Sooner or later, and quite probably sooner, the increasingly mechanized society must face another problem: the problem of income distribution."[3]

Again, progress for whom? As Leontieff suggests, the consequences have not been evenly distributed or the same for everyone. For if the impact of automation on workers has not been ambiguous, neither has the impact on management and those it serves—labor's loss has been their gain.

During the same first thirty year period of our age of automation, corporate after-taxes profits have increased 450%, more than five times the increase in real earnings for workers. To the extent that there have been tangible benefits from automation, they have gone in only one direction: up. This fact was made painfully clear by the telling behavior of the auto industry.

In 1983, as the industry recovered from its temporary slump, General Motors paid 6,000 of its executives almost 200 million dollars in bonuses, averaging more than what an average G.M. worker makes in a year. Ford, not to be outdone, paid its top 45 executives a half million dollars each and its chairman 7.3 million dollars (not a bad year!). According to the *Los Angeles Times*, the record profits which made all this self-serving largesse possible resulted in part from the "introduction of modern equipment and sharp reductions in the automotive labor force."[4]



Andrew Joslin

But there are signs that at least some people have begun to see through this mystifying haze of progress and to recognize more clearly what is at stake. Early in 1984, the Louis Harris opinion survey research organization published the results of an extensive public poll they had conducted on the impact of technology on society. They discovered that people viewed this thing called progress differently depending upon where they sat.

> "The difference between the public and the corporate executives on the matter of robots is a startling 54 percentage points. The tension between social classes is unmistakable. By 39 points, corporate executives are more optimistic about factory automation than are the people who work in factories. In addition, executives are more optimistic than skilled and unskilled labor as a whole by 41 points. These figures represent a potentially combustible mixture."[5]

Apparently, then, people are beginning to see automation madness for what it is, and to recognize the management sermon on progress for the snow job it has always been. "If they have the right to say yes to technology and then move, we have the right to say no and prevent them from moving; that's equality," Frank Emspak, a local union leader at a large G.E. plant in Lynn, Massachusetts recently declared.[6] In other words, the progress of automation proceeds automatically at our expense only if, by our passivity, we allow it.

Participation here demands defiance, defiance not only of the deceptive and disarming mythology of an automatic destiny but also of the destructive designs of those who peddle it. Such defiance alone, of course, is not sufficient. But without it we will never regain the confidence or the power to take this very serious matter of progress back into our own hands, where it belongs.

NOTES

1. For an enlightening history of the idea of the market, see Karl Polanyi, *The Great Transformation*. Boston: Beacon Press, 1944.
2. Gordon Mayer, as quoted in Schlesinger, *Our Own Worst Enemy*.
3. Wassily Leontieff, "The Distribution of Work and Income," *Scientific American*, September 1982.
4. *Los Angeles Times*, May 2, 1984.
5. *The Road After 1984*. Louis Harris & Associates, Inc., 1983.
6. Frank Emspak, as quoted in *Multinational Monitor*, March 1984, p. 18.

FROM HIROSHIMA

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> economic, not technical at all. Insofar as the ABM program serves as a subsidy to the electronics industry, it makes no great difference whether it will work or not. At the meetings of the American Economic Association last year, Walter Adams observed that the current version of the ABM "has been estimated to involve 28 private contractors, with plants located in 42 states...and 182 Congressional districts. Given the political reality of such situations and the economic power of the constituencies involved, there is little hope that an interaction of special interest groups will somehow cancel each other out and that there will emerge some compromise which serves the public interest."[11]

At MIT, students and faculty organized a one day research strike to protest the misuse of scientific and technical resources for war, on March 4, 1969. In order to win the support of the administration, the term "strike" was eliminated, and instead the event was called a "convocation" for consideration of these matters, during which time the university was officially closed.[12] Similar events took place at other universities across the country on that day.

One of the speakers at the MIT convocation, Howard Zinn, described an alternative vision of the role of the university research in society:

> Our power lies in our ability to tell the truth. In this crisis of our age, in the face of enormous evil, we in the academic community are called upon to choose. We can sell our knowledge to the highest bidder, we can waste it, or we can use it on behalf of those values we suspect the government does not share—at the risk of being crushed, but with the hope of transforming both government and society so that someday we can bring children into the world in good conscience.[13]

A year-long struggle over the role of the Instrumentation Laboratory (I-lab), later renamed Draper Laboratory, followed the MIT convocation. The I-lab was a mission-oriented facility which did work primarily for the DOD and NASA, and accounted for nearly one-quarter of MIT's operating expenses.[14] The I-lab had developed the guidance systems for the Titan and Polaris missiles, and at the time was doing research on the Multiple Independently Targetable Re-entry Vehicle of the Poseidon missile.

Many successes resulted from these struggles. In 1970, MIT divested Draper, which fell short of the conversion to peaceful uses that was hoped for by some activists, but was a victory nonetheless. After being met with uncompromising protests in city after city, and a heated national debate in Congress, the DOD finally settled on two ABM sites in North Dakota and Montana to defend Minuteman missile silos (which were decomissioned before they were ever fully completed). In 1971, the Senate Arms Services Committee refused the Nixon administration any funds for additional sites, and the ABM treaty of the 1972 SALT I agreement prohibited any further systems.

But these limited gains were often obtained at the expense of more overarching goals. In his discussion of the ABM, Chomsky gave a hauntingly prophetic warning: "And if the ABM is discarded, some equivalent monstrosity will no doubt take its place until some radical change in ordering of national priorities occurs."[15] Today, in the face of another monstrosity—Reagan's Star Wars weapons plan—we should think hard about what we are really combatting and what tactics we should use.

NOTES

1. Quoted by Howard Zinn in Jonathan Allen's *March 4: Scientists, Students and Society*. Cambridge, MA and London: The MIT Press, 1970, p. 62.
2. Daniel J. Kevles, *The Physicists: The History of a Scientific Community in Modern America*. New York: Vintage Books, 1979, p. 351.
3. *Ibid.*, p. 354.
4. *Ibid.*, p. 355.
5. Norbert Wiener, "From the Archives," *Science, Technology and Human Values*, Summer 1983, pp. 36-38.
6. Dorothy Nelkin, *The University and Military Research: Moral Politics at MIT*. Ithaca, NY and London: Cornell University Press, 1972, p. 6.
7. *Ibid.*, p. 6.
8. Quoted by Noam Chomsky in Allen, *March 4*, pp. 13-14.
9. Joel Primack and Frank Von Hippel, *Advice and Dissent: Scientists in the Political Arena*. New York: Basic Books, Inc., 1974, p. 180.
10. Nelkin, *The University*, p. 8.
11. Allen, *March 4*, pp. 12-13.
12. *Ibid.*, p. xix.
13. *Ibid.*, p. 64.
14. Nelkin, *The University*, p. 2.
15. Quote by Noam Chomsky in Allen, *March 4*, p. 14.

WOMEN & SCIENCE

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there was something wrong, but they also recognized the cost of speaking up. They had a lot to lose in challenging the paradigm.

Power and prestige are still on the side of the old model. The scientific establishment is even today being offered a bribe of over two billion dollars to stay with the old model and work on "pure science," instead of questioning what impact Star Wars will have on their children.

Facing the full implications of the theory of relativity can still cost a scientist his job, his prestige, and his ability to publish. A man who has the guts to think like a woman is likely to be treated like a woman—and paid like a woman.

The perceptions of women represent a world view that is essential for human survival, and the energies—and anger—of women are one of the most potent catalysts for the ongoing revolution in science. The solution to the problem of sexism in science is not to provide women with models to help them become successful in traditional scientific ways, but for women to take the lead in the transformation of science.

NOTES

1. Carol Gilligan, *In a Different Voice: Psychological Theory and Women's Development*. Harvard University Press, 1982.
2. *Ibid.*, pp. 24-32.
3. Fritjof Capra, *The Turning Point: Science, Society, and the Rising Culture*. Bantam Books, 1982.
4. Elise Boulding, "Perspectives of Women Researchers on Disarmament, National Security and World Order." *Women Studies International Quarterly*, vol. 5, no. 1, 1981.
5. Walter Isaacson, "Reagan for the Defense," *Time*, April 4, 1983, pp. 8-19; and Michael Lerner, "A New Nuclear Heresy," *Newsweek*, April 4, 1983, pp. 20-22.
6. Barbara Stanford, "Fear of Success and Hope for Survival: An Analysis of the Relationship Perspective in Three U.S. Peace Education Projects." Paper presented at the International Peace Research Association in Gyor, Hungary, 1983.
7. Elizabeth Dodson Gray develops this concept further in *Green Paradise Lost*, Roundtable Press, Wellesley, Mass., 1979.
8. Office of Technology Assessment of the Congress of the United States, *The Effects of Nuclear War*, 1979, p. 9.
9. *Ibid.*
10. David Cheney and Karen Wieckert, "STS Education: The Costs of Questioning," *Tough Questions*, Spring 1985.

Alan Turing: The Enigma

Andrew Hodges
Simon and Schuster, 1983
587 pp., $22.50 cloth,
$10.95 paperback

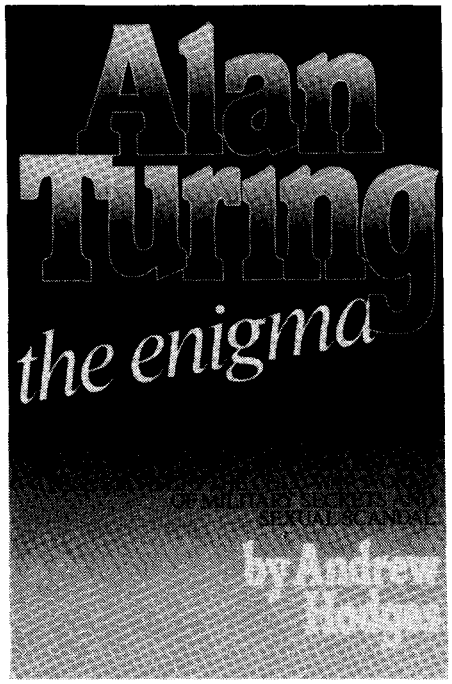
reviewed by
Larry Goldsmith

"He had wanted the commonest in nature; he liked ordinary things. But he found himself to be an ordinary English homosexual atheist mathematician. It would not be easy."

As a student of chemistry, surrounded by smelly chemicals and arcane apparatus, I envied the world of the humanities.

A frequent refugee in the departments of history and philosophy, I overheard the conversations of people whose academic interests, however rarefied by ivory-tower altitude, touched upon the politics and emotions of everyday life. The laws of thermodynamics may have caused me fascination and delight, but they provided no substance during the difficult years of coming out. As the only openly gay student in a predominantly male science and engineering college, I watched as one by one, fellow students encountered conflict between gay identity and the scientific milieu and responded with religious moralism, self-denial, heavy drinking, dropping out, and attempted suicide.

Andrew Hodges, a co-author of the 1974 pamphlet "With Downcast Gays," has written an excellent biography of Alan Turing (1912-1954), the English mathematician whose concept, known to history as the "Turing Machine," enabled the



British to crack the code used by the German navy in World War II, and marked the conceptual birth of the modern computer. Hodges, himself a gay mathematician, examines Turing's predicament as a gay man entering the field of mathematics in the best and worst of times.

The war effort gave Turing and his colleagues extraordinary freedom to pursue their mathematical and scientific interests with the boundless, enthusiastic support of His Majesty's Government. At the same time, in the face of increasingly enforced criminal sanctions against homosexuality (not to mention the historically testy relationship between "national security" and homosexuality), Turing was compelled to be as tight-lipped about his sexual interests as he was about his absolutely secret military research.

Hodges's account of Turing's life is extraordinary in its depth, its breadth, and its captivating, often dramatic narrative. Hodges successfully combines his mathematician's understanding of Turing's work (and the rare ability to explain it in intelligible, even elegant layperson's terms) with a gay liberationist's perspective on the meticulously researched details of Turing's life. Though the book is infused throughout with a critical understanding of the homophobic oppression Turing experienced, Hodges as a biographer has great respect for his subject; he carefully avoids the temptation to judge a historical figure by anachronistic contemporary standards.

Hodges examines the parallel secrets in Turing's professional and erotic lives, devoting part of his discussion to Turing's identity as an "outsider," both as a gay man and as a mathematician working on problems that were considered eccentric. He even looks for concrete indications of Turing's sexuality in his work, but does not generalize about deterministic relationships in a way that can trivialize the concept of a gay identity.

Hodges also tells a good story. Probably no other book ever written about a mathematician will move its readers to tears. At Sherbourne, a preparatory boarding school, Turing fell in love with Christopher Morcom, a fellow student of similar scientific bent. But their close platonic friendship was tragically interrupted when Morcom, struck by tuberculosis, died suddenly in 1930. Turing carried the memory of Morcom with him to King's College, Cambridge, where he might have consorted with the likes of John Maynard Keynes, E.M. Forster, or the Bloomsbury group. But, Hodges notes, "he did not find a place in this compartment; nor did the King's aesthete set, flourishing in its protected corner, reach out to a shy mathematician.... In many ways, he was too ordinary for King's."

Instead, Turing set to work in relative isolation, turning his mind upon itself to examine the processes of human thought in solving mathematical problems. By 1936, Turing had published a revolutionary paper, "Computable Numbers," that showed how mechanical means could be used to carry out certain types of thought processes.

In 1939, following the recognition he earned for "Computable Numbers" and the importance of his new ideas in the science of cryptography, the British government pressed Turing into service at Bletchley Park. This Victorian country house, situated halfway between Oxford and Cambridge, served as the wartime headquarters for the Government

Code and Cypher School. There, Turing and his colleagues ultimately built computing machines that cracked the codes used by the Germans to encrypt the radio messages directing their ships against the British. It was a success without which the British might never have survived the war.

Except for the absolute secrecy surrounding the very existence of his work (an official secrecy that endures to this day), Turing would likely have been named a war hero. Instead, at the end of the war, Turing faced a scientific-governmental bureaucracy no longer charging ahead at the accelerated pace of wartime urgency. An antisocial individual with little taste for the sort of competitive diplomacy required to get ahead in conventional academia, Turing found only frustration.

Turing relocated to Manchester, settling into a position at the university and continuing to muse about minds and machines. In 1950, he published another paper, "Computing, Machinery and Intelligence," that approached, from a philosophical point of view, his ideas about thinking, intelligence, free will, and consciousness.

In Manchester, Turing also became more active and more outspoken about his sexuality. But while such a coming out was undoubtedly personally liberating, it was exceedingly dangerous. Not only was homosexuality illegal in England at the time, but Turing was also under particular scrutiny as the possessor of what was still one of the British government's best-kept secrets.

In 1952, Turing rather naively reported to the police a minor burglary probably committed by one of the young men he had slept with. The crime of "gross indecency" soon overshadowed any interest the police may have had in investigating the burglary. Turing eventually pleaded guilty and was sentenced to a year-long program of hormone treatments. Henceforth, Turing traveled outside of England to satisfy his sexual desires.

The treatments and probation ended in April 1953, and Turing shortly thereafter was appointed to a readership at the university that would insure him an income and the opportunity to continue his work for at least several years. But a year later, on June 7,1954, Alan Turing bit into an apple he had laced with cyanide, and died.

Turing left no suicide note, and friends said later that he did not seem unusually depressed or distraught just before his death. But Hodges reveals a particular incident that may have cast a shadow over Turing's final days. During a trip to Norway, Turing met a young man named Kjell. On Turing's invitation, Kjell came to England for a visit. In a letter to his friend and colleague Robin Gandy, Turing later wrote:

"The Kjell crisis has now evaporated. It was very active for about a week. It started by my getting a p.c. from him saying he was on his way to visit me. At one stage police over the N. of England were out searching for him, especially in Wilmslow, Manchester, Newcastle, etc. I will tell you all one day. He is now back in Bergen without me even seeing him!" (p. 483)

Turing never did tell all, and the relevant government records are state secrets. It would not be unreasonable to assume, however, that whatever "crisis" Kjell had sparked occurred at a level more threatening than the local constabulary. Alan Turing had been entrusted with the sort of secrets not generally imparted to homosexuals. If the mere fact of his sexuality were not enough, Turing had the audacity to speak publicly and remorselessly about his sexuality.

Turing's utter disregard for the rules of rank and class are evident throughout his biography. His low opinion of authority was, as in the circumstances surrounding his arrest, often militant to a fault. It's tempting to describe Turing as a mathematician with a "gay male sensibility"—a mocking, even campy critic of conventionality, an outsider whose oppression and isolation fostered a sharpened sensitivity and creativity.

Did Turing look down, we might want to ask ourselves, on social hierarchy as heterosexist repression? How did he relate to women? Did he understand the connections between racism, sexism, militarism (he was, after all, at the center of the military-industrial complex), and homophobia? And did this political consciousness affect his work? Though Hodges's book will raise these questions in the minds of many lesbian and gay readers, the answers, as they apply to Alan Turing, are less important for their voyeuristic appeal than for the picture they begin to paint of systematic oppression in the world. Alan Turing, whose life fills this book, brings that clouded picture into sharper focus.

Larry Goldsmith works with the National Lawyers Guild.

In Brief

Breaking Ground for the New Nicaragua

by Richard Congress

$1 from Bill Fleming, Project TECLE, 521 Harold Ave. NE, Atlanta, GA 30307

Through narrative and interviews, this pamphlet tells the story of the Luis Hernandez Aguilar School of Agricultural Mechanization. The school trains tractor operators, truck drivers, mechanics, welders and machinists from private, cooperative and state farms. Written by a member of a North American construction brigade that built a kitchen and dining room for the school, the booklet also tells a story of international cooperation.

As the school's director, Apolinar Altamirano, says, "One of the things I would like to explain to the people of the United States is that we are all from America. We are all brothers. I would like to call on the working people of the United States, the common people, to learn a little of our situation. This is my invitation to the North American people."

by the Bomb's early light

by Paul Boyer

Pantheon, $22.50

Living today in the year 40 N.A. (Nuclear Age), we embrace the perilous worlds around and within us, often taking for granted the horrible risks of nuclear weapons. But everything, from the way we plan for tomorrow to the way we love, has been profoundly changed by the advent of nuclear power.

by the Bomb's early light, by cultural historian Paul Boyer, is an encyclopedic study of U.S. reactions to atomic power made during the first five years after the bombings of Hiroshima and Nagasaki. Boyer examines culture—including music, politics, psychology, and literature—in an effort to determine how an entire generation of Americans experienced the beginning of a new age. Using anecdotal material as well as historical data, Boyer helps to illuminate our own dark era.

The book suffers somewhat from too many facts and too little analysis. For example, Boyer devotes too much space to how John Hersey's *Hiroshima* was received by critics. He also fails to analyze adequately the political effects of the Bomb. Nevertheless, his work is invaluable as a resource for those concerned with the first years of the Nuclear Age and their relationship to today. One must hope that others, inspired by Boyer's lead, will continue to examine the nuclear legacy.

—Scott Haas

How I Saved the World

by Philip Slater

E.P. Dutton, $16.95

Our few human resources make it seem rather unlikely, barring a miracle, that we will be able to prevent what could be the final human disaster—nuclear holocaust. But to paraphrase D.H. Lawrence, writing in *The Plumed Serpent*, "how exciting to be part of that miracle."

How I Saved the World, Philip Slater's first novel, relates the story of Taylor and Grace, a pair of Californians who wander from one miracle to the next in their haste to prevent imminent nuclear holocaust. Remarkably, they defeat a swarm of scientists and spies whose cavalier attitude nearly causes the total destruction of Boston and Kiev.

Slater, best known as the author of *The Pursuit of Loneliness*, satirizes the ways of thinking which perpetuate nuclear danger. He urges us to reconsider traps of consciousness: our own forms of self-imprisonment.

As Taylor and Grace relate their adventures—many of which take place on astral planes!—readers can imagine their own magical experiences which grant them refuge from the pressures of this most dangerous of times. Clearly, Slater suggests, the miracles that will vanquish the nuclear crisis lie imbedded in our consciousness. He reminds us that imagination provides not just an escape, but the ideas that must lead to progressive change. Best of all, his reminder comes in the form of well-written and extremely amusing satire. *—Scott Haas*

Hunger in America
The Growing Epidemic

by the Physician Task Force on Hunger in America

Wesleyan University Press, Middletown, CT, 1985

Sponsored by the Harvard School of Public Health, the Physician Task Force on Hunger in America carried out the third major study of hunger and malnourishment in the U.S., following up studies conducted in 1967 and 1977. The earliest of these studies, part of Lyndon Johnson's "war on poverty", found a degree of hunger and deprivation that shocked a public used to the complacent images of America in the fifties and the war-driven boom of the sixties.

That first report contributed to a dramatic expansion of the Food Stamp program, increased funding for school lunch and elderly nutrition programs, and improvement of social services for rural and urban families in need. The 1977 report found much of the same poverty, but the widespread hunger that accompanied it in the previous decade had been largely eliminated.

Since that second report, much has changed in our political and cultural landscape. The gap between rich and poor has increased. Military spending has bloated the federal deficit, which in turn has been used to justify cuts in social services. The results are predictable: hunger has returned for millions of

Americans. The findings of the Physician Task Force document this return in a conclusive manner.

Much of the report focuses on hunger's impact on health. Low birth weights, stunted childhood growth, cancers linked to poor nutrition, and tuberculosis are just a few of the health risks faced by the hungry. The sense of hopelessness and depression experienced by the poor also increases their vulnerability to life-threatening illness. The picture conveyed by the Task Force is of a nation whose social organism is weakening within from neglect and misdirection of resources.

Hunger in America's forceful indictment of governmental negligence and "mean-spiritedness" is especially important, coming from a group of physicians in the mainstream of the medical establishment. But their recommendations are much more general than their diagnosis. They call for firm bipartisan action to feed the poor, without asking why our economy allows for so much poverty in the first place. Nevertheless, the Physician Task Force has outlined some of the hidden costs of the Reagan counterrevolution.

—Gary Keenan

The High Cost of High Tech
The Dark Side of The Chip

by Lenny Siegel & John Markoff

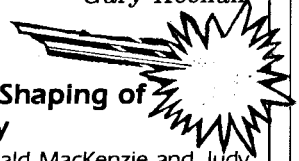
Bessie/Harper and Row, $16.50, 1985

Siegel and Markoff add their voices to the chorus warning us of the uncritical acceptance of the chip. Like MIT's Joseph Weizenbaum and Tufts' Ken Geiser, Siegel and Markoff are alarmed at the encroachment of technology on human values at work, in schools and homes.

Their analysis of the values embodied in automated work—routinization, centralized control, disempowerment—is thoughtful and rooted in the ways we interact through technology. They address the military uses of computers, questioning their reliability in increasingly complex systems.

The use of computers in surveillance, their impact on work skills, high tech trade wars with Asia, and the development of Silicon Valley are given succinct treatments. The authors are concerned that the fascination with the computer's capabilities undermines our commitment to the still-incomplete project of making democracy work.

—Gary Keenan



The Social Shaping of Technology

edited by Donald MacKenzie and Judy Wajcman

Open University Press, Philadelpia, 1985

This excellent anthology collects writings from major writerson technology's social history. Karl Marx, Langdon Winner, David Noble, Harry Braverman, and Mary Kaldor are among the authors presented in four groups of essays. The first outlines the general issues of the politics of technology. In three subsequent sections, the technology of work, the home, and the military are examined in concrete case studies. The anthology format allows exposure in small doses to important authors whose books are not written with casual readers in mind.

The essay by Mary Kaldor on military procurement provides an historical grounding for the arms race, and her piece on Russian arms technology offers a seldom-heard perspective on what considerations go into Soviet weapons policy. And the chapters on domestic technology offer compelling examples of how the development of the "modern home" has served to keep many women tied to unpaid, unrecognized labor.

—Gary Keenan

Dumping in Malaysia

by Michael Bedford

Papan, Malaysia

The people north of Kuala Lumpur, the capital of Malaysia, are fighting a battle against entering the nuclear age.

In the middle of 1984, they learned of the Asian Rare Earth Corporation's (ARE) plans to build a series of concrete-lined trenches for dumping radioactive thorium hydroxide. Local citizens, together with Sahabat Alam Malaysia (Friends of the Earth, Malaysia) are fighting against the licensing of the dumpsite.

Thorium hydroxide is obtained from monazite, a by-product of tin mining. Monazite contains natural thorium, which when processed yields radioactive thorium hydroxide. While the ARE company performs this processing, the two major owners of the tin mining operation are Beh Minerals of Malaysia and Mitsubishi Chemical Corporation of Japan. The minerals are exported, mainly to the U.S., Australia, and Japan.

The present ARE dumpsite is located next to the company's processing area. Tests at the site have shown high levels of radioactivity, with quantities of waste material found in open drums and plastic bags that were exposed to the elements. The level of radiation recorded was several times higher than permissible, and workers have received exposures without the protection of monitoring badges.

A new thorium hydroxide dumpsite was proposed for the village of Parit. This site, near a rubber estate and one kilometer from the village's residential area, is on a hill and surrounded by swamp land. It's also next to the water catchment area for the Parit community.

Ten-foot-wide containment trenches were built to store the radioactive waste. As word of the dumpsite reached the Parit community, villagers requested meetings with

local government officials and scientists to answer their concerns. An official from the atomic research center (PUSPATI) told the Parit townspeople that radiation levels at the waste site would be low, and that the design of the dumpsite was completely safe. But after continuing community pressure, authorities agreed to move the site to Papan.

The Papan site is on a hill, two kilometers from the village of Lahat, with a population of over 2,000 people. This new site was also near an uncovered reservoir which supplies drinking water to the surrounding district. Fish ponds at the foot of the dumpsite provide food and income for the area.

As in Parit, residents of Papan organized to question the safety of the dumpsite. At a series of public meetings, officials stated that the site would contain thorium hydroxide waste only if it met all International Atomic Energy Agency (IAEA) certifications. Opposition grew as Sabahat Alam Malaysia surveyed the Papan site and found major construction faults. IAEA specifications called for four inches of concrete in the bottom of the waste ditch, while the ARE site had only two inches. Cracks were also discovered in the walls of the ditch.

When citizens learned that the site was not being built to meet safety standards, they tried to stop further construction with road blocks and demonstrations. Protests occurred outside local government offices, and a month-long petition drive collected more than 9,100 signatures calling for the non-licensing of the dumpsite. Ignoring local concerns, Prime Minister Datuk Sei Datuk Mahathi announced plans to proceed with construction.

A third site was chosen to avoid further public protest. Located about five kilometers from the Papan site, ARE built a final dumpsite.

Opposition to the waste disposal site has diminished, but concern about the hazards at the ARE factory continues. The government has no plans to move the factory site away from populated areas. Recent tests conducted around the factory in 1985 found levels of radioactivity eight times higher than expected. All levels exceed the International Commission for Radiological Protection's standard of 500 rems per year for the general public.

On February 1, 1985, eight local residents filed a lawsuit against the ARE company over the dumpsite and factory safety and health questions. They asked for a mandatory injunction to restrain the factory from producing more wastes, and to remove all accumulated waste.

Radioactive waste monitoring is one of the many activities of Sahabat Alam Malaysia. They have organized a larger network of more than 200 groups, the Asia-Pacific People's Environment Network, to fight environmental degradation throughout the third world. For more information, and to receive their bimonthly *Environmental News Digest,* write to Sahabat Alam Malaysia/APPEN at 37, Loring Birch, Penang, West Malaysia.

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