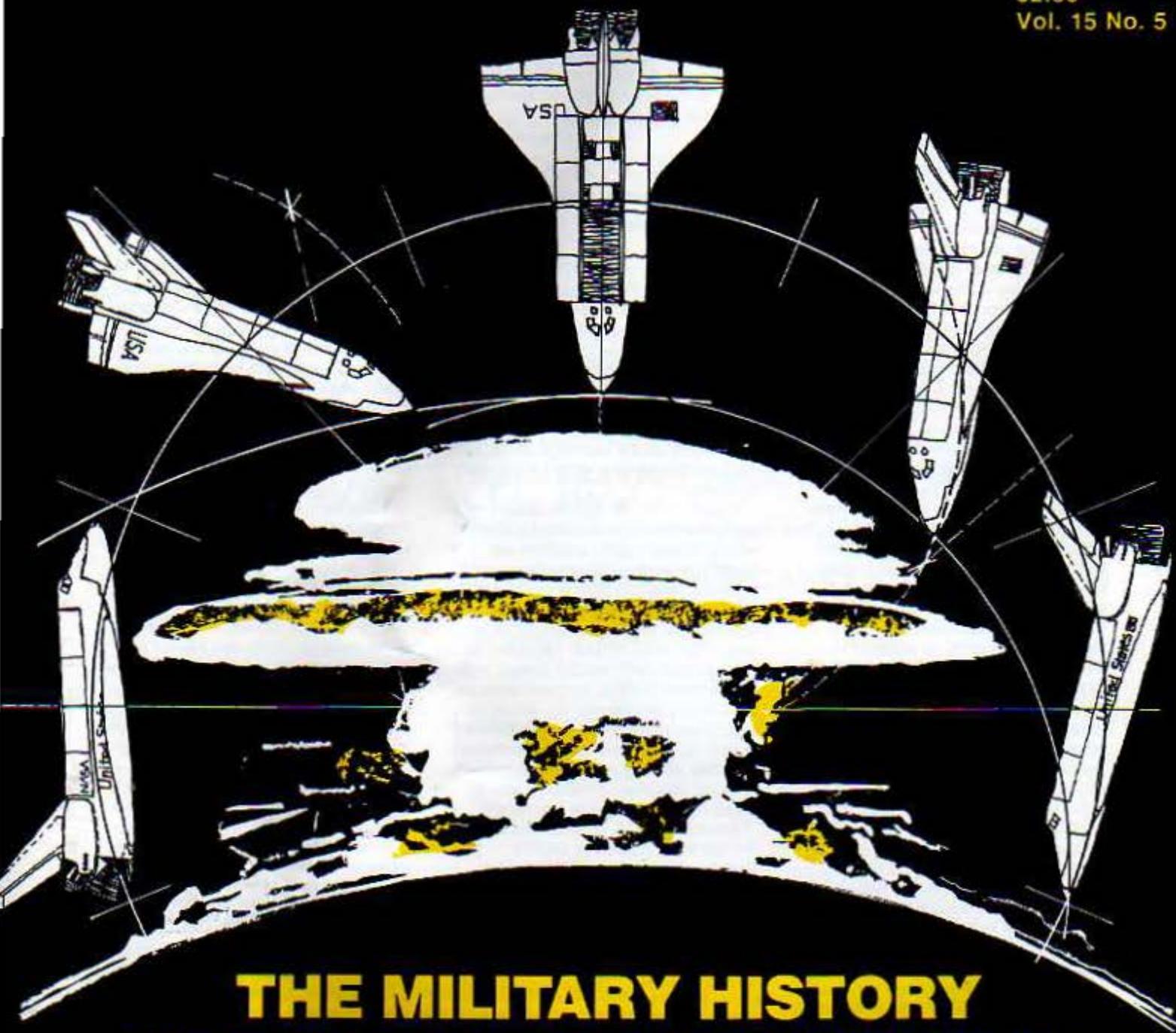


SCIENCE FOR THE PEOPLE

\$2.50
Vol. 15 No. 5



THE MILITARY HISTORY OF THE U.S. SPACE SHUTTLE

Freeman/Mead Retrospective
Reagan's Nuclear Proliferation Policies

Ecological Warfare
Seveso Update

letters

WARREN COUNTY

Dear SftP:

Ken Geiser and Gerry Waneck's article on PCBs and Warren County offered many important insights into the politics of locating the PCBs landfill in Warren County. Clearly, as Ken Ferruccio pointed out, the site was chosen because of political powerlessness of the residents of Warren County and not because of any technical qualifications. There are dozens of more appropriate sites in North Carolina (many of which we are now finding out are being considered as low level radioactive waste sites) due to the thick clay layers present under much of the state.

While the Warren County landfill is by no means perfect (it lacks a leachate collection system) it can hardly be compared, as the authors did, to the horribly planned and operated landfills in New Jersey which have contaminated groundwater in many communities. Leakage from properly constructed landfills does occur, however this usually occurs when highly polar solvents, which easily move through soil, are landfilled. If the original plan, which would place other hazardous wastes in the landfill in addition to PCBs, is enacted, the Warren County site could become a disaster. There is no doubt that the Warren County landfill will eventually leak and for this reason the PCBs should be treated and destroyed. But, hopefully, the people of Warren County will not receive significant exposure to PCBs from the landfill for decades. In the meantime, perhaps a reasonable method for destruction of the 6000 truckloads of PCBs-laden dirt will be devised.

It is not my intention to be an apologist for the state or the EPA in this matter. I fully support a local community's right to refuse a hazardous waste site and their right to know and inspect potential hazardous industrial sites. I am dismayed, however, when organizers at times use the rhetoric of fear to motivate people. These are the tactics of the reactionary right which is so entrenched in N.C. It is an approach that seems to lack integrity and certainly increases the psychological stress placed on the local community.

I concur with author's conclusions about the efficacy of the Warren County protest. It is an important sign of resurgent community activism in the South. Hopefully, it will blossom into a statewide political movement but the obstacles are considerable. I look forward to hearing more about water issues and commend you on the high quality of your magazine.

Douglas A. Bell

RESOURCE WARS

Dear SftP:

In Al Gedick's article, "Resource Wars: Fighting the Mining Industry in the Lake Superior Region," (SftP Vol. 15, No. 3) my study of Wisconsin community attitudes toward radioactive waste is cited as a DOE-sponsored pilot study. This is false. My study was funded by the State of Wisconsin as part of its submission to the NRC Waste Confidence Hearings. DOE simply used my data in its own study of incentives.

Gedick contends that my study "creates the impression that the DOE is willing to take public concerns seriously" by asking citizens what would be required before they would accept a radioactive waste repository in their community. The "incentives" (DOE's term—not mine) include payments to communities, information access, independent monitoring, representation on a governing board, and the power to shut down the facility. Gedick correctly asserts that DOE has never entertained seriously offering communities these incentives, and that is precisely why I asked these questions in my survey.

Ironically, DOE attacked my study for the same reasons as Gedick, namely, that the incentives were unrealistic. I contend that such incentives

as the power to shut down a facility should be offered and that, if DOE fails to identify and address these public concerns and desires, efforts to site a waste repository will encounter stiff public opposition, including civil disobedience.

John E. Kelly

"CURING COVER UP"

Dear SftP:

Congratulations on your recent (March/April 1983) issue. I think it's the best ever. I especially enjoyed reading the well-written and meticulously documented piece on psychiatry by Jenny Miller. A decade of research into the social construction of medical knowledge has led me to similar conclusions. I think perhaps the image that "mental illness" professionals present covers up much violence and death while feeding the masses a koda-chrome print of curing and caring. Meanwhile, the National Institute of Mental Health endorses both electroshock and psychosurgery of which women are the major recipients.

Therefore, I found it ironic that the violence against women study group could use NIMH as their authoritative voice on violence. Perhaps the institute's experiential knowledge with their own violence compensates for their sloppy research models. I also wonder if the printing of the two violent images on pages 20 and 21 might cause harm to women who read "Science for the People." As we learn more on relationships between images and behavior whether for non-assaultive physiological repair or harmful propaganda, hopefully we can make more knowledgeable choices about our lives without resorting to psychiatric violence or re-editing the First Admendment in the name of science.

Dee dee NeHira

UPCOMING ISSUE OF SFTP

The East Coast Editorial Committee is now soliciting articles for the March/April 1984 special issue on "Babies and Science: From Reproductive Technologies to Parental Bonding." Please send articles, outlines, graphics and other material to: SCIENCE for the PEOPLE, 897 Main St., Cambridge, MA 02139.

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Science for the People is published bi-monthly by the Science Resource Center, Inc., a non-profit corporation. The magazine is edited and produced by the national organization Science for the People. Our address is 897 Main St., Cambridge, MA 02139; our phone number is (617) 547-0370. We offer a progressive view of science and technology, covering a broad range of issues. We welcome contributions of all kinds; articles, letters, book reviews, artwork, cartoons, news notes, etc. If possible, please type manuscripts (double spaced) and send three copies. Be sure to keep one copy for yourself. Unless otherwise stated, all material in this magazine is copyright 1983 by Science for the People. Typesetting at Platform Studio, 636 Beacon St., Boston, MA 02215. (617) 424-1497.

Subscription rates (for one year/six issues): \$15 (regular base rate), foreign surface mail add \$5; foreign air mail subscription rates as follows, reflecting differences in mailing costs: to Canada add \$5.50, to Latin America add \$9.50, to Europe add \$13.00, to Asia/Africa add \$16.50; institutional/library rate: \$24; member subscription \$25. Member subscribers receive the magazine, our newsletter and other internal communications. Foreign subscribers must remit in \$U.S. with either an International Money Order or a check drawn on a U.S. bank.

Bookstores may order on consignment directly from Science for the People or through Carrier Pigeon Distributors, P.O. Box 2783, Boston, MA 02208. The magazine is available on microfilm from Xerox Microfilms, 300 North Zeeb Rd., Ann Arbor,

MI 48109. *Science for the People* is indexed in *Alternative Press Index*, P.O. Box 7229, Baltimore, MD 21218. Science for the People's ISSN (International Standard Serial Number) is: 0048-9662.

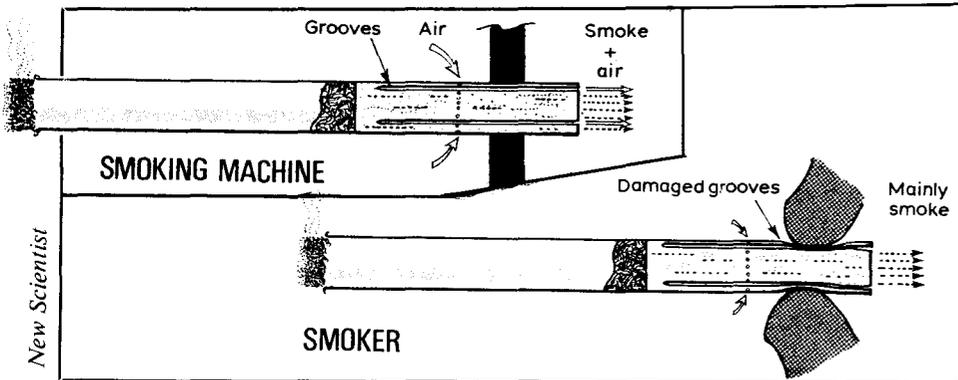
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news notes

Low-tar Scam: Cigarettes Cheat the Tar Tables



There is no question that "low-tar" cigarettes have been tremendously lucrative for the cigarette companies. It is now coming to the public attention, however, that the purported health benefits from such "lower-tar" cigarettes may be nonexistent.

Surprisingly enough, much of this information is coming to light due to complaints brought by a group of cigarette companies against a competitor, British American Tobacco company (BAT). BAT, makers of Barclay brand of cigarettes, has been sued by the Federal Trade Commission (FTC), due to complaints from other cigarette manufacturers that BAT has designed the cigarette to "cheat" the smoking machines which afforded the brand a 99 percent tar-free rating.

Apparently, the "aerodynamic holes" on Barclay's "Actron" filter, while allowing air intake in the standard FTC smoking machines, are immediately crushed by a normal smoker. The result: the normal smoker receives up to *seven times* the advertised dosage of tar.

The Barclay case seems to be a fairly dramatic example, but health officials in the U.S. and abroad have found that it is far from exceptional. Barclay's filter is routinely crushed; many other "low-tar" filters have small holes or vents which a normal smoker routinely covers up with his/her fingers. According to John Pinney, head of the U.S. Surgeon General's Office on Smoking and Health: "I think it is reasonable to say that the cigarette companies in this country over the last five or ten years have been moving towards and actually

now have designed cigarettes specifically for the purpose of showing a low tar-nicotine yield on the FTC machine."

The FTC has changed Barclay's 1-mg. tar rating, but the larger question remains of how to more accurately assess the tar-nicotine yields of the myriad of "low-tar" cigarettes. With consumers flocking to the brands advertising lower ratings, and cigarette manufacturers, in the name of stonger flavor, trying to outsmart the rating machines, no clear resolution seems to be forthcoming.

—*New Scientist*, July 14&21, 1983

Report Faults EPA Regulations

In a report which could have important legislative ramifications, the Office of Technology Assessment (OTA), has claimed that current hazardous waste laws promulgated by the EPA are seriously inadequate for protecting public health and the environment.

The EPA regulations exempt producers of less than one ton of hazardous waste per month. The OTA claims that as a result of this loophole only 40 million of the 250 million tons of hazardous waste generated in the U.S. each year are subject to regulation. In addition, several clearly hazardous materials (such as dioxin) are not on the EPA's list of regulated materials.

Also according to the report, the OTA projects that the EPA "superfund" will fall short by as much as *35 billion dollars* of the amount required to clean up

the 15,000 sites so far identified. Among the suggestions included in the report is an incentive program whereby companies' clean-up rates be based on the total amount of waste generated, rather than the volume of materials used, as is currently the case. Representative James Florio (D-N.J.) has already introduced legislation which reflects many of the OTA's findings. While its chances for passage in the House are said to be good, its future in the Senate is more uncertain.

—*Foresight Newsletter*

Real-Life Star Wars

In a small news item in *Aviation Week and Space Technology*, the U.S. Air Force's Airborne Laser Laboratory proudly announced that they successfully destroyed five "Raytheon/Ford Aerospace AIM-9 Sidewinder air-to-air missiles" in a series of tests recently conducted over the Naval Weapons Center range at China Lake, California.

The 400-kw carbon dioxide laser, built by United Technologies, "tracked" and "defeated" all the missiles launched in the two-week test series. This underreported news item signals a substantial step towards making yet another new breed of sophisticated weaponry a reality. President Reagan's "Star Wars" speech aside, peace activists must take seriously the growing military and industry enthusiasm over the future deployment of such high-energy lasers and particle beam systems. The time to oppose this latest in the multi-billion dollar arms race is now.

SEND US A NOTE

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Tampon Update: Task Force at Work on Standards

In the summer of 1981, the FDA asked the American Society for Testing and Materials (ASTM) to bring together representatives of industry and the public for the purpose of developing standards for menstrual tampons. ASTM created a tampon task force composed of representatives of five tampon manufacturers and of six consumer organizations. The FDA is also represented.

When the task force began meeting early in 1982, it was clear that the two sides were far apart in their ideas. The consumers wanted product changes to improve safety, and label modifications to give users better information, especially about ingredients. The producers claimed there was nothing wrong with tampons as they are. They asserted they had scientific and technical knowledge to support their claim, but refused to share any of this with the consumers.

After almost two years of meetings, many of the basic differences remain unresolved. Nevertheless, a draft standard is being prepared and will be sent out this fall for comments and suggestions.

One area where some progress has been made is in the provision for absorbency-testing and absorbency labeling to allow consumers to make cross-brand comparisons. Producers are also considering standardizing the meaning of the words "Regular," "Super," and "Super-plus" so that they will be approximately the same for all brands, which is not presently the case. At the urging of the FDA, the industry is also considering advising women to use the least absorbent tampon necessary, in order to minimize the risk of toxic shock syndrome. (TSS is not being specifically addressed by the task force because the FDA has already mandated warnings on the labels.)

However, in the important matter of revealing ingredients, producers still insist on their proprietary rights to protection against competition, and refuse to make available information on all fibers and chemicals used in tampons. Because the vagina is a highly absorptive area, there is the possibility that tampon materials cause irritations and allergic reactions. If all ingredients were known, the medical community could better assess patients' ills and the scientific community could be spurred to more research. It is ironic that women can know the contents of cosmetics that are used on the outside of their bodies but not know what goes into their bodies.

Producers are reluctant to list warnings about possible adverse effects, discounting medical and other evidence concerning layering, drying, irritations, ulcerations, etc., due to tampon use. In addition, there is no agreement on effective testing methods for bacteriological safety, biocompatibility, detection of particulates and leachables—all of which are considered by consumers to be essential to safety.

The draft of standards reflects these disagreements and solicits comments from the general public. These comments will be taken into consideration in the voting process. We hope that readers of *SftP* will write for copies of the draft and will send comments to the ASTM. Requests should be addressed to: Peter Brown, Tampon Task Force, ASTM, 1916 Race Street, Philadelphia, PA 19103.

—Judith Beck and Charlotte Oram

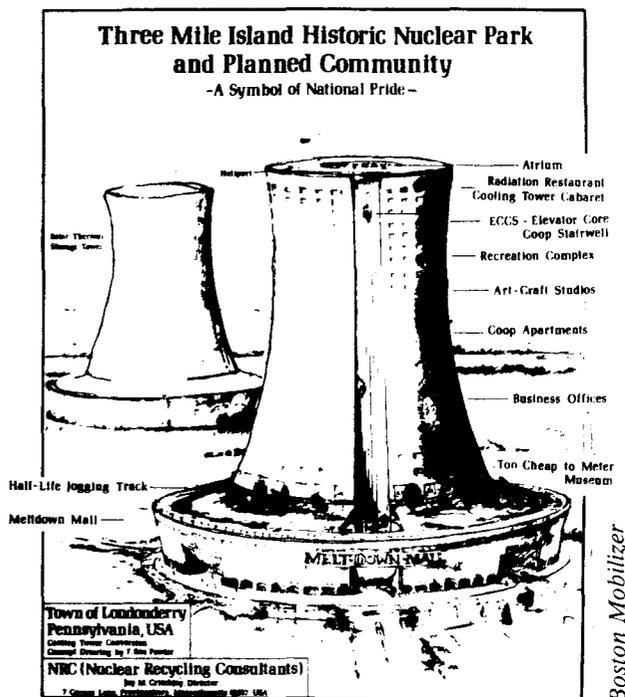
Meltdown Mall?

Are you one of those who knows that your nearby nuclear power plant is a dangerous and outmoded facility, but are troubled by the obstacle of what to do with the site after you force the plant to shut down? A new group calling itself the Nuclear Recycling Consultants (NRC) has some ideas on the subject. Focusing on the problem of converting nuclear facilities and sites to productive community use, the group's first conversion proposal involves the infamous Three Mile Island site (TMI).

Inoperative since the near melt-down in 1979, TMI is regarded by the NRC as an appropriate site for their first conver-

sion project which they have entitled: "Three Mile Island Historic Nuclear Park and Planned Community—A Symbol of National Pride" (see diagram). NRC Director and author of the proposal, Jay M. Critchley commented on the plan: "While the idea of the cooling tower coop apartments, cabaret, and meltdown mall may seem both funny and ridiculous, I see it as much more. The proposal discounts the efficacy of nuclear energy, and goes right to the issue of conversion, and offers a positive and creative response."

—information from the
Boston Mobilizer



THE MILITARY HISTORY OF THE SPACE SHUTTLE

by Jack Manno

The U.S. Space Shuttle, or Space Transportation System (STS), is one of the most imaginative inventions in the history of political compromises. In 1972, when shuttle development was approved, the overall U.S. Space program was in such a quandry over what to do and where to go after the moon, that a transportation system, a seemingly neutral concept which made no demands on its promoters to determine what would be transported where, appeared to be the best possible next major space project. To NASA, the shuttle decision meant receiving at least one piece of its grand program for space exploration which had once included occupied space stations circling the Earth and Moon, an Earth/Moon Shuttlecraft, and a landing of astronauts on Mars in the 1980s. To the aerospace industry, the shuttle represented a major new batch of contracts just when the industry was reeling from the end of Apollo work, the completion of the missile build-up of the 1960s, the Congressional defeat of the Supersonic Transport Plane, and the general lack of new starts resulting from the financial demands of fighting the war in Vietnam. To the Air Force, the shuttle represented a crucial step toward the "manned" military space presence the Air Force had been craving for years. The shuttle was all the more welcome by the Air Force since it compensated for the Nixon Defense Department's cancellation of the military space station which had been under development, running way over budget, since 1965, with no launch date yet in sight. To Congress, worried and under pressure from constituents concerned with the high costs and questionable social utility of space activities, the shuttle promoters promised, incorrectly and deceptively, that the costs of spaceflight would be reduced in the future.

The key to the success of the shuttle compromise was the active support of the Air Force. Military space strategists had long acknowledged that space would

only be fully exploited for military advantage when access to Earth orbit had become routine. Even though the military had wanted its own shuttle, the Air Force faced the budgetary realities of the early 1970s and agreed to join with NASA on a Space Transportation System if the Air Force were allowed to make changes on NASA's design. The shuttle orbiter would have to be enlarged to enable it to carry the heavy, complex communications, navigation and radar satellites the Air Force had under development. The Air Force required that a second, military shuttle launchsite be constructed and that two orbiters be reserved for military launches. Also required by the Air Force was a modification of the spacecraft design to extend the lateral maneuverability during re-entry. And, finally, the Pentagon was to receive top priority for the shuttle's cargo, which included the power to bump other shuttle payloads to meet its own schedules. These changes greatly increased development time and costs, but the Air Force, by agreeing to redesign its future military satellites for launching from the shuttle cargo bay, endowed NASA with the power to claim that its budget, and its largest single project, were necessary for national security and therefore protected from cost-cutting criticism.

Birth of the Shuttle

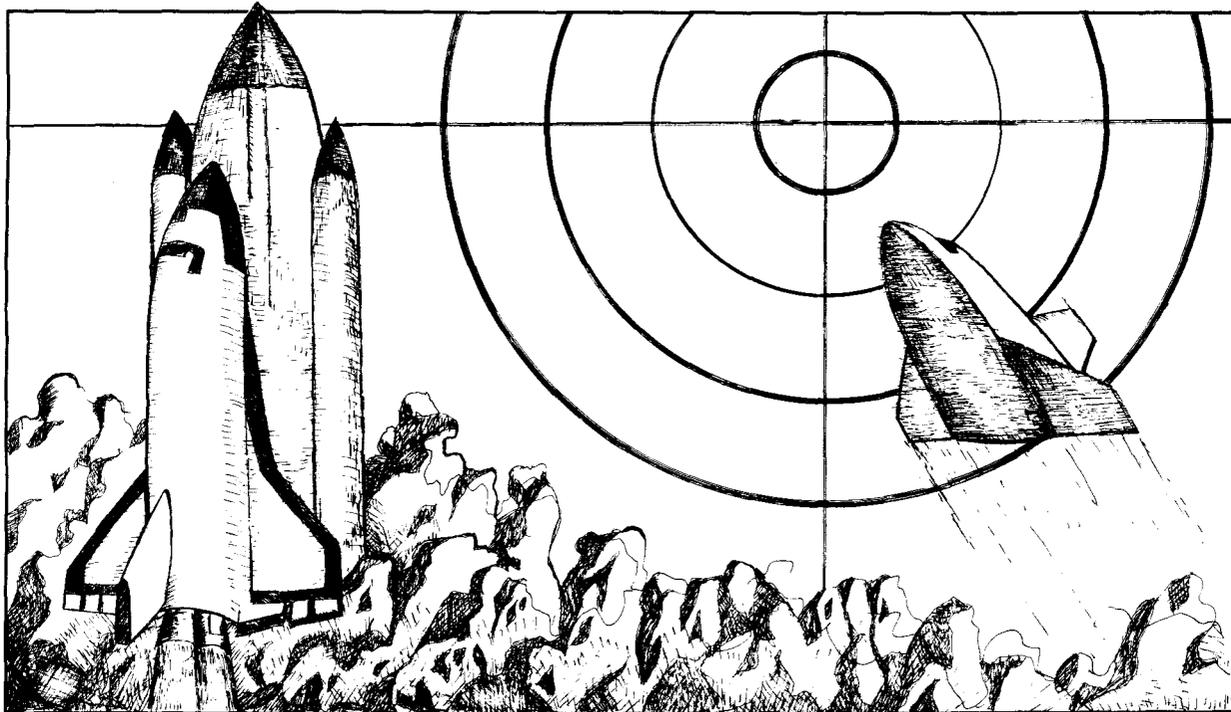
Although it has masqueraded as many things, including a venture with immediate commercial potential, in reality, the shuttle, a vehicle designed to open "near-earth space" to routine use, has been one of the two top priorities of the military space program for twenty years. In the mid-1960s, as the Apollo landing approached, both President Johnson's Science Advisory Committee and the Space Sciences Committee of the National Academy of Sciences took up the task of establishing goals for the space program in the post-Apollo period. Both of these civilian groups made a wide range of recommendations including an extension of Apollo moon exploration, an upgraded planetary science program leading to a landing of astronauts on the

Jack Manno is a writer and peace activist based in Syracuse New York. His forthcoming book, Arming the Heavens: The Hidden Military Agenda for Space 1945-1995, is published by Dodd, Mead & Co.

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planet Mars, and an orbiting space station for biomedical and astronomical research.¹ Only once, and that in reference to long-range concepts beyond even the Mars landing, was the need for a space shuttle ever mentioned. And yet, only five years later, President Nixon, who had campaigned on a platform “deploring the lack of emphasis on the military use of space for America’s defense,”² made the space shuttle the only space vehicle program to receive the funding necessary to be operative in the 1980s.

next day, Harold Brown, then director of Defense Research and Engineering (later Carter’s Defense Secretary and most recently a critic of Reagan administration plans for anti-satellite weaponry) was asked by the committee to list his top priorities for technical advances in the post-Apollo period. The first priority according to Brown, was the development of electronics for spacecraft that could survive the intense radiation environment in space after a nuclear exchange, the second was a reusable spacecraft.



Keith McHenry/Brushfire Graphics

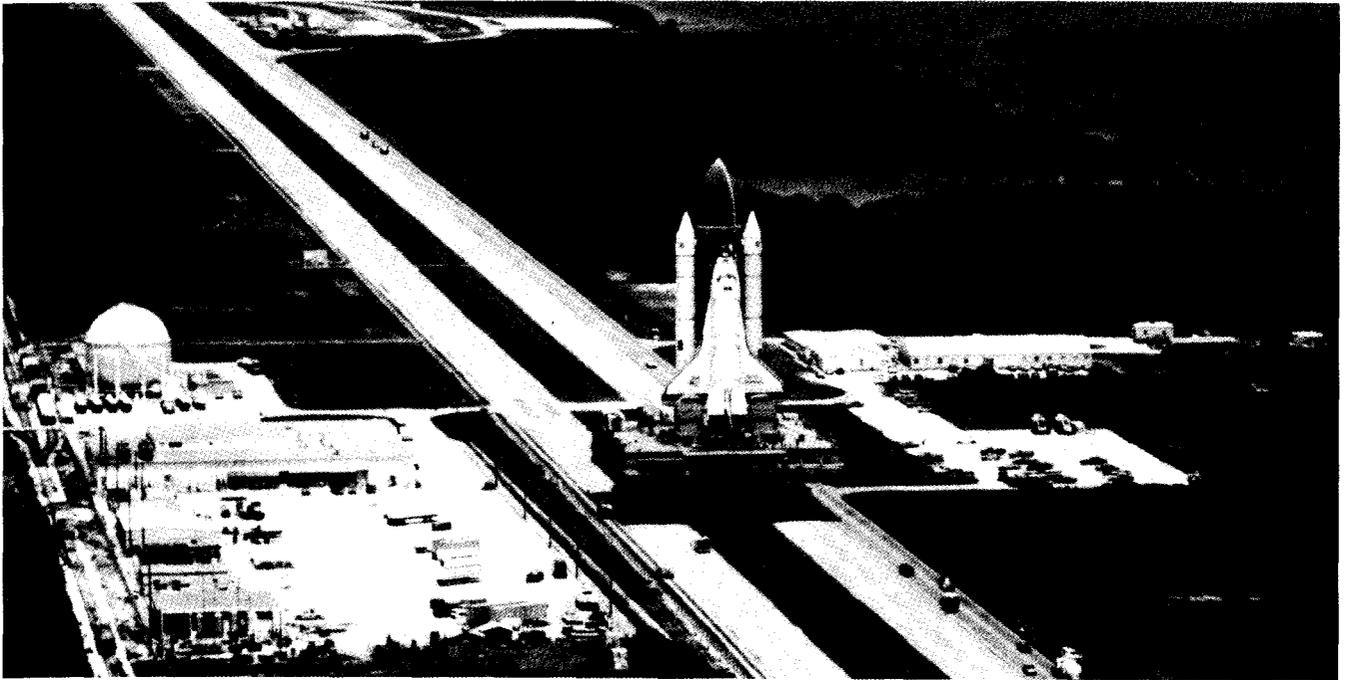
In 1965, the Senate Committee on Aeronautical and Space Sciences held hearings on National Goals for the Post-Apollo period.³ Scientists from NASA and the academic community testified during the three-day hearings. No one thought a shuttle important enough to mention. While the hearings were in progress, President Johnson announced the appointment of General Bernard Adolph Schriever to command the Defense Department’s orbiting surveillance and military command center, euphemistically known as the Manned Orbiting Laboratory (MOL). General Schriever did not appear at the post-Apollo hearings, but he let it be known through Air Force-favored Senators on the committee that he thought the 1970s should see a great deal more effort put into the field of reusable, maneuverable, reentry vehicles. Later, committee members put NASA’s Deputy Administrator Robert Seamans on the defensive about the issue of reusable spacecraft.

“After talking to General Schriever,” Seamans reassured the committee, “a group that is reviewing recoverable boosters, is reviewing our total national program developing maneuverable reentry vehicles.” The

“Beachhead in Space”

For the past twenty years, General Schriever has been trying to get a vehicle that would serve as what NASA administrator George Low once called the shuttle, “a beachhead in space.” As head of the Air Force Systems Command and later as a \$600-per-day consultant for “long range planning and marketing planning for major weapons systems”⁴ for the U.S. aerospace corporations, Schriever persistently preached the importance of a space shuttle as a prerequisite for a U.S. “Space Force.”

Schriever was uncommonly young for an Air Force commander when he first won the admiration of the nation’s military-industrial elite by brazenly and successfully battling with his boss, General Curtis LeMay, in the intra-Air Force competition between missiles and heavy bombers. Years before Sputnik, Schriever was convinced that “nations will fight the battles of the future in Space.”⁵ At that time, Schriever had command of the Western Development Range where the first in-



Nasa

“Although it has masqueraded as many things, including a venture with immediate commercial potential, in reality, the shuttle . . . has been one of the top two priorities of the military space program for twenty years.”

intermediate range ballistic missiles were being developed by the Air Force.

The major problem in the development of atomic missiles was the fact that the early A-bombs weighed thousands of pounds. The rocket thrust needed to deliver such “Big Boys” was inconceivable at the time, and, given the fact that LeMay’s beloved B-52s were based in a ring encircling the Soviet Union, quite unnecessary. But Schriever was a man with a mission. He established liaisons with Edward Teller and John Von Neumann. Teller and Neumann, as members of an Air Force special panel on long range bombardment with rockets, calculated that H-bombs could be made compact enough to fit within the nose cone of a rocket-launched missile. The Atomic Energy Commission promised to deliver the mini-bombs by the early 1960s, and Schriever won top-priority commitment and funding to arrange the marriage between high technology rocketry and mass destruction. As the popular press put it, his “skilled midwifery gave birth to a whole family of missiles.”⁶

Sputnik and the “Red Menace in Space”

The launch of Sputnik I in 1957 was seized upon by the early space military men as evidence of the Soviet threat from space. They used this perceived threat to extract funding for items on an ever-expanding shopping list of exotic space strategies and weapons to defeat the “red menace in space.” The real competition, however,

was not between communism and capitalism but between competing branches of the Armed services in the U.S. The Air Force began *Project Lunex*, a plan to establish an Air Force base, complete with moon-to-earth bombardment capability. *Project Man in Space Soonest* was the Air Force code name for the attempt to send a pilot into space with an advanced version of the Air Force’s rocket-launched test aircraft, the X-15. The Army ballistic missile division, which had the services of the 127 rocket scientists who had developed Hitler’s rocket-launched Vengeance weapons in WWII, had an intriguing plan for troop transport through space: *Project Man Very High* imagined rapid delivery of troops through rocket-launched intercontinental troop carriers. Even the Central Intelligence Agency coveted use of a spacecraft to drop agents surreptitiously behind enemy lines. There were schemes for orbiting bombs and bombers, moon-based surveillance, and a space command center lifted into space by a series of nuclear explosions beneath a lifting platform. There seemed to be no end to the inter-service rivalry for the “sexiest” space assignments, nor the potential for profits to flow into the U.S. aerospace industry.

There were other, more sedate military thinkers who understood that routine military utilization of space was at least twenty years off and that the technological groundwork for a “Space Force” would have to be laid slowly and deliberately. President Eisenhower, in an attempt to gain control over the post-Sputnik an-

arcy, created the National Aeronautics and Space Administration (NASA) and gave it charge over the nation's space program. Space research and development directly related to "the defense of the nation" was kept under the jurisdiction of the Department of Defense. This situation effectively concealed the military space program behind a NASA front and government propaganda about the "peaceful use of outer space."

In 1960, a change of administration brought President Kennedy to the White House with long-time military space supporter Lyndon Johnson as his vice president. Kennedy gave Johnson power over the space program. The Air Force Space and Missile Systems Organization, under the direction of General Schriever, attempted to win back the leadership of the Space program through a major publicity campaign critical of NASA. However, James Webb, the new NASA administrator (who had received his position through his connections with LBJ's Oklahoma oil millionaire friend, Senator Kerr of Kerr-McGee infamy) was able to win the support of top Defense Department brass by guaranteeing to the military significant decision-making power over the choices of NASA experiments and spaceflight goals.⁷ This guarantee later led to the Gemini planning board which decided on the nature of Gemini missions. On the planning board were General Schriever, and Air Force General Homer Boushey who was formerly in charge of *Project Lunex* and fond of describing the value of moon-to-earth bombardment as a guaranteed retaliatory strike capability.⁸

Air Force Systems Command Established

In March of 1961, Secretary of Defense McNamara issued a directive placing the bulk of military space planning, development, production and launching under the command of a new Air Force department to be known as Air Force Systems Command. None other than General Schriever was placed in charge of the new command. In order to take up this new responsibility, the Air Force instituted a study committee headed by Secretary of the Air Force Trevor Gardner which included General Schriever, Edward Teller, and Walter Dornberger, the former Reich General who headed up the Nazi rocket program. The committee drafted a secret report which set the goals and priorities for future Air Force space activity. In a report to the United States Armed Forces (USAF) Association, General Schriever, speaking for the committee, concluded, that:

more emphasis on manned spacecraft is required. We must be able to use space on a routine, daily basis. In order to develop this ability we must begin by developing the ability to navigate and maneuver spacecraft, the ability to go into space and return to earth at times and places chosen to support a selected mission, the ability to rendezvous in space, and accomplish refueling or cargo transfer—in short, to transport, use and support man in space.⁹

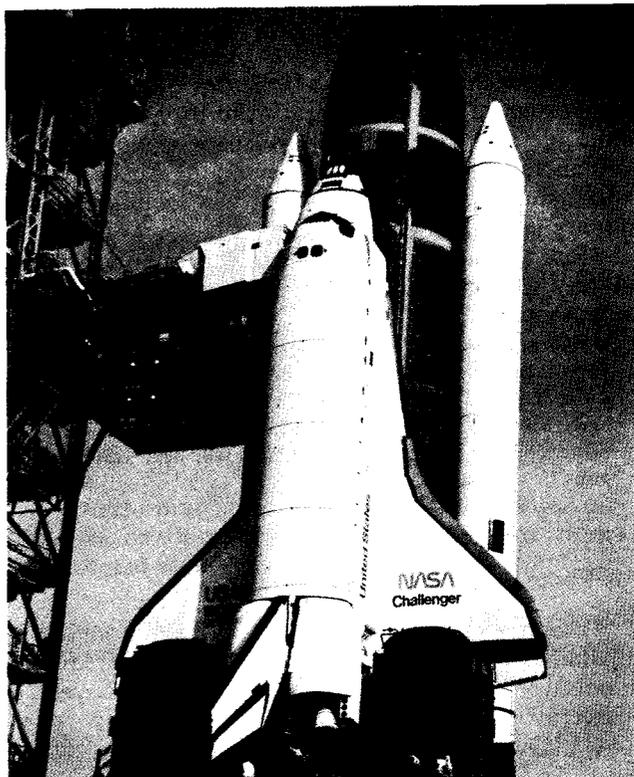
All of these features outlined by Schriever have been incorporated into the design of the shuttle and its future offspring.

Schriever was clear about the anti-satellite function of his proposed spacecraft. "I believe it is clear," he told the USAF Association, "that we must be able to observe or inspect satellites and determine whether or not an unidentified satellite is hostile or friendly; should a satellite be determined to be hostile, then we must have the capability to neutralize it."¹⁰

Walter Dornberger, in a paper entitled "Military Utilization of Space," wrote,

For the thinking man [sic] space is nothing but an extension of his field of operations, an extension in the vertical direction. I am not talking about ballistic missiles, these are not true spacecraft or space vehicles. Ballistic missiles are no more spacecraft than bullets and shells fired through the atmosphere are aircraft. I am talking about spacecraft in orbit, manned and unmanned, maneuverable, accurate, and recoverable.¹¹

Despite the Air Force's desire for a piloted space program, Secretary McNamara remained unconvinced. Nuclear weapons tests in space had demonstrated just how vulnerable space systems would be to the effects of nuclear blasts in space.¹² Due to the near vacuum of space, nothing absorbs the radiation a nuclear blast releases. Severe damage will occur to spacecraft thousands of miles from the blast. Space would be made impassable to piloted spacecraft, astronauts would receive



"The Air Force Project, Dyna Soar, the true conceptual ancestor to the shuttle, had its origins in the work of the German rocket scientists and technicians in World War Two."

lethal dosages of radiation, ground/space communication would be blacked out, all from the relatively simple gesture of exploding nuclear weapons anywhere within the field of the Earth's magnetic force. To the Air Force, which hoped to extend its domain vertically into space, such systems vulnerability was unwelcome news. But the specifics of the results from nuclear tests in space were kept top secret, and therefore could not be used to silence the clamoring for a Space Force.

Piloted or automatic, interplanetary or earth orbit, military or civilian, armed or unarmed; from Sputnik in 1957 to Yuri Gagarin's first flight, billions of dollars were spent, and there was no consensus among the competing interests who were controlling the U.S. space program. President Kennedy, seeing virtually the same space mess that Eisenhower had tried to clean up with NASA, concluded it was necessary to decide on a reachable goal for the space program.¹³ The goal of landing astronauts on the moon within the decade was sufficiently far away to allow the U.S. to catch the Soviet space lead, dramatic enough to gain popular support, and expensive enough to please the aerospace industry. In 1961, Kennedy announced Project Apollo.

With Project Apollo established, it was clear that the NASA was going to be involved with "manned" spaceflight for the next decade at least. Still Schriever's Air Force Systems Command did not settle back into a support role. They demanded and got decision-making control over the experiments to be flown in the interim space program Project Gemini. And they continued to argue for a "manned" military space station. NASA administrator James Webb reassured the Air Force that NASA could quickly shift its huge new facilities over to military use if needed.¹⁴

But Schriever grew increasingly impatient for a military spacecraft. He told a *Fortune* magazine journalist that:

if military men do have a mission in space the specifications of their equipment will be sharply different from those required by NASA. Unlike NASA the military will need a capability for sustained, repetitive quick reaction. Once in space, a military pilot will need to rendezvous.¹⁵

Air Force Precursors of the Shuttle

Demonstrating maneuverability and rendezvous capabilities with Project Gemini became increasingly important to the Air Force as its two maneuverable spacecraft projects were running into cost overruns, delays and failures. *SAINT* (for SATellite INTERcept) was a design for an anti-satellite spacecraft that would go into co-orbit with a target satellite, inspect, or hone in and destroy it. *SAINT* failed to proceed beyond research and design due to the not-unreasonable political decision made by the McNamara Defense Department that such an anti-satellite capability would only

lead to an anti-satellite race sure to interfere with the growing reliance on military satellites for routine military reconnaissance, communications and early warning. *Dyna-Soar* (for dynamic soaring) was a plan for a rocket-launched space glider that would demonstrate re-entry capabilities.

Dyna-Soar, the true conceptual ancestor to the shuttle, had its origins in the work of the German rocket scientists and technicians in World War Two. In 1944, Walter Dornberger presented Hitler with a proposal for a space bomber. The proposed rocket-boosted craft would skip along the upper fringes of the atmosphere, reenter to drop its load of bombs over New York City, and glide to a landing in the Pacific where the crew would be met by submarine. The war came to an end before the glide bomber could be developed and tested.

But Dornberger did not abandon his idea. He brought it with him when he came to the U.S. as a consultant to the Air Force. One of the first papers he wrote for the Air Force was for a massive system of orbiting nuclear bombs capable of being reentered on command from U.S. ground control.¹⁷ In order to service such a weapons system, a maneuverable and recoverable spaceplane would be necessary. He sold the Bell Aviation Corporation on the idea, which immediately received a study contract from the Air Force. He and one of his Vengeance weapons colleagues, Kraft Ehrlicke, went to work for Bell Aviation in Buffalo. For ten years *Dyna-Soar* maneuvered through budgets and design stages. It eventually became entwined with the X-15 rocket-launched test aircraft, and was designated the x-20 under contract with North American Aviation, the corporation later to reap the big contract for the shuttle.

In 1963, both *SAINT* and *Dyna-Soar* were cancelled. With the rapidly rising costs of Apollo and the early stages of the war in Indochina, McNamara's Defense Department was hard pressed to justify a "manned" military space program for which there was no proven need. The logistics of orbital bombardment were far more clumsy than earth-based ballistic missile bombardment, and the radiation and blast vulnerability of space systems remained an unsolved problem. With the cancellations of its two major piloted spacecraft programs, the Air Force placed all its hopes and attentions onto Project Gemini. The Air Force and NASA agreed to joint participation in Gemini which culminated in the Gemini 5 flight during which the two astronauts carried out six secret onboard military experiments.

On August 25 1965, President Johnson once again reawakened Air Force hopes for a manned space program by approving the development of the Air Force Manned Orbiting Laboratory (MOL). Yet MOL never became a top priority and fell four years later after spending \$1.3 billion, to the Apollo, Vietnam, Great So-

Continued on pg. 30

Long-Term Consequences of Aerial Herbicide Application in Vietnam

ECOLOGICAL WARFARE

by John Vandermeer

Science and technology have always had a central role in modern warfare. Unfortunately, in the invention of new warfare technology it is sometimes difficult to foresee its ultimate consequences. In Vietnam a new and rather bizarre war technology was utilized by the U.S. Hundreds of gallons of poisonous chemicals were sprayed from the sky. Technically this was not chemical warfare, since the poisons were not meant to kill people, at least not meant to kill them directly. The direct intentions of those who sprayed the chemicals was to kill vegetation, to make barren areas, to destroy all sorts of plants.

A recent official Air Force history reveals something of the ultimate purpose behind the sprayings. The destruction of mangrove forests, upland forests, and croplands was designed, at least partly, to destroy the resource base of the human populations so that relocation into areas controlled by the U.S. would become necessary. The relationship of a population to its basic resources is one of the central foci of the science of ecology. A war technology which intends to uncouple the population from its resource base would seem to be most appropriately titled "ecological warfare."

Ecology is a very complicated science. Or perhaps it is not so complicated but just unknown. As an ecologist I have more faith even in long-term weather forecasting than I have in ecologists' abilities to predict what will happen to an ecosystem. This is one of the reasons that the concept of ecological warfare is so disturbing: its long-term consequences are almost completely unpredictable and unknowable. Putting into a soldier's hand

a weapon whose action is largely unknown should be a cause for concern, to put it mildly.

The first, and so far only, use of ecological warfare was by the U.S. in Vietnam. Earlier this year, I had the opportunity to view a small part of the consequences of that warfare, over ten years after its application, during a week I spent in Vietnam participating in an international conference on the use of herbicides in war.

"Operation Ranch Hand"

Between 1961 and 1971, the U.S. Air Force used defoliating agents in an operation officially titled: Operation Ranch Hand. The Air Force used the following chemicals:

- 2,4-dichlorophenoxyacetic acid, (2,4-D)
- 2,4,5-trichlorophenoxyacetic acid, (2,4,5-T)
- 3,4,5,6-trichloropicolinic (Picloram)
- sodium dimethyl arsenate
- dimethylarsinic acid (cacodylic acid).

Three different mixtures of these chemicals were used, named according to the color of the label on the containers in which they were shipped. These three mixtures were:

- **Agent orange**—1:1 mixture of 2,4-D and 2,4,5-T
- **Agent white**—4:1 mixture of 2,4-D and Picloram
- **Agent blue**—6:1 mixture sodium dimethyl arsenate and cacodylic acid.

Agents orange and white were used for the destruction of forests, plantations, and other woody vegetation. Agent blue was specially designed for killing rice.

The most conservative estimates suggest that about 12% of all the upland forests were sprayed with agents orange or white. Other estimates put that figure as high as 44%. It is impossible to know for sure. Approximately 30% of the mangrove forests, and 8% of the total agricultural land were sprayed, the mangroves with agents orange and white, the agricultural areas with agent blue.

John Vandermeer is a longstanding member of Science for the People. He teaches biology and ecology at the University of Michigan. He is also active in the New World Agriculture Group (MWAG) and the Farm Labor Organizing committee.

The Extent and Persistence of Damage

The *Ma Da* forest was a typical Southeast Asian forest. Its dominant trees belonged to the family whose scientific name is *Dipterocarpaceae*, tall, straight-bowled trees, highly regarded for their valuable timber. The so-called *mixed Dipterocarp* forest (a forest composed of numerous tree species most of which are members of the Dipterocarp family) is the dominant forest type in the highlands of Vietnam. Without doubt, it represented a significant resource base upon which a forest-products industry could have been based, and a basis of existence for small hunting and farming communities.

The *Ma Da* forest, as a typical Southeast Asian Dipterocarp forest, most certainly included small sections in which agricultural practices of various types were in progress well before the war. But such areas were minor in extent, judging from pre-spray aerial photographs, and were mainly of the shifting cultivation sort. In a sense they represented a natural disturbance which presumably had only a temporary effect in any given location. In any case, such temporarily degraded areas appeared to be very minor in extent, judging from pre-spray aerial photos. Those photos suggest an almost continuous expanse of virtually undisturbed tropical forest.

Peter Ashton, director of the Arnold Arboretum at Harvard University, compared U.S. Air Force spray records with aerial photographs before and after the spraying of agent orange. Defoliation missions were flown along north-south strips, along some strips only once, along other strips as many as five times. Matching the spray records with post-spray aerial photos leaves little doubt that the extent of damage was directly correlated with the number of times a strip was sprayed. In those strips sprayed five times, virtually all of the woody vegetation was destroyed, while in those sprayed just once only the tallest trees were killed.

This initial damage from the defoliating chemicals is only the beginning of a story that is not yet completely understood. Today, ten years after the defoliating missions, extensive areas of the *Ma Da* forest remain severely degraded. But the most severely degraded areas of today do not correspond to the strips of original heavy deforestation. There is little doubt that the defoliating missions initiated a process that has resulted in the massive deforested areas we see today. But the exact patterns of devastation we see today are the consequences of certain ecological phenomena that would have been difficult to predict *a priori*, and other factors that we still do not understand.

Just before the sprayings, the U.S. forces had constructed a military road extending from the river that defines the southeastern border of the *Ma Da* forest to an airstrip located in the northwestern corner of the forest. That road created access to parts of the forest that

had not been easily accessible before. The new access, coupled with the strips of grassland created by the spraying, generated new ecological conditions. Apparently local hunters were able to take advantage of both the access and the newly created grasslands. The grasslands were repeatedly burned during the dry season, creating perfect conditions for attracting game. The burnt grasses sent new shoots up from their roots. The new tender shoots are preferred food for deer and other wild game in the area. This, then, is one interpretation of the surprising persistence of the excessively degraded grasslands. The initial spraying initiated source areas for grasslands, and the access provided by the road brought the hunters who set the fires which caused the grasslands to extend along the road.

The regional patterns of the grasslands in the *Ma Da* forest at first glance seem to correspond to this interpretation. Along virtually the entire extent of the road are grasslands extending 50 to 100 yards to either side. During a visit to the forest in January of 1983, I found that numerous fires had already been set even though the dry season had just begun. If one goes beyond the grasslands which surround this road, one encounters very young forest, sometimes composed of only very young trees and shrubs characteristic of a forest in the beginning stages of regeneration. There were even some areas where Dipterocarp seedlings were encountered in the understory of these young forests, suggesting that in these local areas the forest might again become economically important as early as 40 years from now.

But this interpretation does have its problems. While it is true that a majority of *Ma Da's* grassland occurs along the road (probably about 60% of the total grassland in the forest), there is another vast swath of grassland extending at a right angle from the road. This second region of grassland, probably 20% of the total, also does not correspond to the original strips of devastated land. There is little evidence to suggest that some sort of increased access has caused this second region of grassland. The remaining 20% of the grasslands in the *Ma Da* forest occur as smaller parcels, almost as islands in a sea of apparently regenerating forest. These final sections are easily interpretable as remnants of the original defoliated strips. But the major sections of grasslands, along the road and the one section at right angles to the road, are not interpretable as resulting from the original spraying nor as resulting from initial spraying followed by increased access due to the road.

An alternative explanation, unfortunately not easily verifiable, was offered to me by a Vietnamese forester as I was travelling through the *Ma Da* forest. According to him, after the initial sprayings, which are part of official Air Force records, the forest began recuperating, as it is now in many parts of the *Ma Da* forest. To keep the road open, however, and to keep a secondary patrol area secure, repeated sprayings occurred

along the road and the secondary patrol area, sprayings that were far more frequent than the original missions, but were not recorded in official Air Force records. This interpretation could account quite accurately for the patterns of occurrence of the grasslands in the *Ma Da* forest. If the official U.S. Air Force records are complete and accurate, this interpretation is wrong. Again, there is, unfortunately, no way to know.

Regardless of the details, the present condition of the forest exhibits certain obvious patterns which lead to many concrete problems.

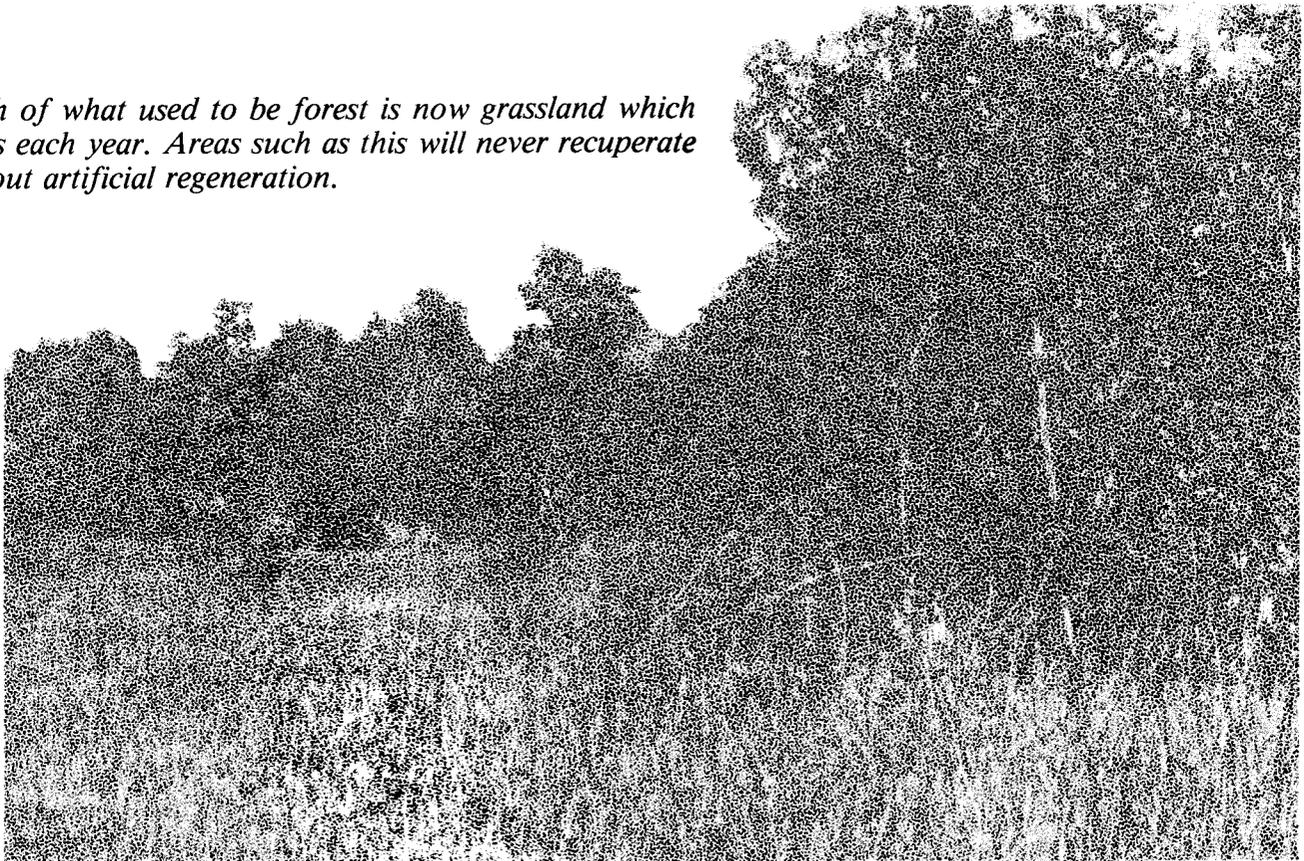
First, approximately 30% of the *Ma Da* forest is in grassland which, because of dry season fires, will never regenerate spontaneously. These conditions had their origins with the herbicide missions, but their present details have been molded by ecological forces operative since the spraying. Second, while approximately 70% of the *Ma Da* forest seems to be regenerating, depending on the stage of regeneration of particular patches and on who is making the estimate, it will take from 40 to 100 years for those areas that are regenerating to reach economically useful stages.

Projections for Recovery

During my visit to the *Ma Da* forest, it was possible to make several observations which raise important and sometimes perplexing questions about what is happening. Standing on the edge of the forest in a region that had been recently burned, it was quite obvious that the trees on the edge of the forest had been rather severely damaged by the fire. What seems to be happening, at least in the areas I saw, is the grasslands seem to be extending into the regenerating forest. This is an ominous sign. The projection that within 40 to 100 years those regions that currently contain regenerating forests will be economically viable is obviously wrong if the grasslands expand so as to destroy those forests that are expected to regenerate. Are the grasslands in fact extending into the regenerating forest and, if so, how fast? We don't know for sure, and with current availability of human and material resources in Vietnam, we are not likely to find out.

But there are more questions which remain unanswered. A careful examination of the soil revealed a

Much of what used to be forest is now grassland which burns each year. Areas such as this will never recuperate without artificial regeneration.



John Vandermeer



disturbing pattern. Comparing the soil in the grassland with the soil only three or four yards away but within a regenerating forest, the difference was striking. The soil in the grassland was dominated by large pebble-like structures (technically known as lateritic concretions) and was notable for a lack of obvious organic matter. The soil in the forest did not exhibit a preponderance of such structure and had a substantial amount of organic matter. The most likely cause of this pattern, in my opinion, is erosion. Immediately after a fire the surface of the soil is exposed to wind erosion. The organic matter (in the form of ash) as well as the smaller soil particles are blown out of the grasslands and probably become concentrated in the forested areas. The result is a continual degradation of the resource base. As the grass regenerates after a fire, it pulls nutrients out of the soil. When it burns, those nutrients are released in the form of ash. If the ash blows away before it can be incorporated into the soil, these nutrients are lost to the system. In this way, the grasslands could become continually more denuded. The final result would be the formation of a desert-like region in which the nutrient resource base is so small that few plants would be capable of living there. And if the grasslands continue to erode into the forest, the formation of such nutrient poor deserts could become quite expansive. Although this scenario is a "worst possible case" scenario, it is nevertheless clearly within the realm of the possible, especially judging from our past inability to predict what will happen when ecological systems are disturbed.

Overall Effects on Forests and Agriculture

The case of the *Ma Da* forest, described in some detail above, illustrates some of the complexities involved in just trying to understand what happened, to say nothing of trying to predict what will happen in the future. But *Ma Da* was only one small part of the herbicide program, and the herbicide program was only part of the ecological war (although a major part). To fully

appreciate the full ecological war one must consider all the areas that were sprayed, the health consequences of this spraying, and finally the other techniques of ecological warfare, such as mechanical land cleaning, saturation bombing, and even weather modification.

Looking at other areas that were sprayed we are faced with a very diverse set of circumstances, each of which is at least as complicated as the *Ma Da* forest, with possibly unique ecological processes and problems to be considered. For example, the *A Luoi* forest in *Binh Tri Thien* province has apparently degraded to grassland much more extensively than the *Ma Da* forest (for largely unknown reasons). Potential for spontaneous recovery, possibilities for artificial reforestation, and likelihood of further degradation are likely to be considerably different in the two forests, even though they are both upland mixed Dipterocarp forests.

The other two categories of sprayed lands, mangroves and agricultural, present totally different problems. Some of the mangrove forests were especially heavily destroyed. The forests on the *Ca Mau* peninsula (southern *Mekong* delta), for example, were 60 to 70% destroyed. While it is relatively easy to calculate the percent of the area that was totally deforested, discerning the effects on the mangrove ecosystem in general has proved to be virtually impossible thus far. Despite intensive study by Vietnamese and other scientists, a group of international experts on mangrove ecology could not even agree on what the ecological consequences were, not to mention the potentials for recovery. Admittedly, some of the uncertainty results from a lack of properly conducted studies of the ecosystem, due mainly to the lack of technical and monetary resources in Vietnam. But the main problem lies with how little we really understand about the functioning of this type of ecosystem.

Agricultural land does not appear to have suffered nearly as severely, on a long-term basis, as the forested regions. While some studies report on traces of the herbicides found in the soils yet today, other studies strongly dispute that claim. Again the effects are largely unknown, but since most of the herbicide-damaged land is now back in production one must conclude that the long-term consequences were not so severe as in the forests.

Effects on Human Health

At least two of the chemicals used are known to present severe long-term human health hazards. 2,4-D is now known to be both carcinogenic and teratogenic (causes birth defects), while 2,4,5-T inevitably contains

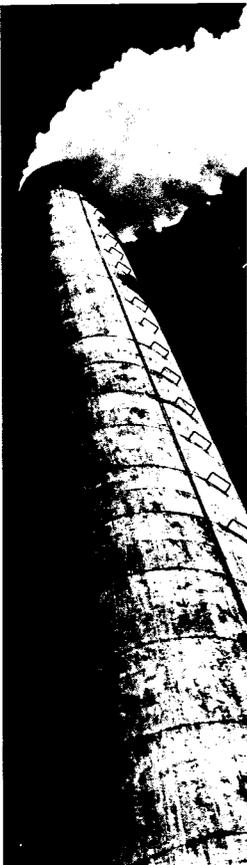
the contaminant 2,3,7,8-tetrachlorodioxin (dioxin), which is one of the most potent carcinogens known. (See the Seveso update in this issue, as well as "Dow and Dioxin," SftP Vol. 15, No. 4.) Given the known hazards of these chemicals, it would be surprising if they did not have some health effects on the human population.

However, the studies necessary to conclusively demonstrate such effects are notoriously difficult to perform. Consequently, there is little one can say about what is known with certainty about human health consequences. Again, in this case, the major problem is the lack of technical and monetary resources presently available in Vietnam. Nevertheless, there appears to be an overwhelming amount of circumstantial evidence pointing to various health problems associated with herbicide application. Increased rates of birth defects in exposed versus unexposed populations, more frequent problems with pregnancies, higher incidence of chromosomal abnormalities, and higher rates of various carcinomas have all been repeatedly reported. But despite such abundant circumstantial evidence, most of the studies seem to be open to alternative interpretation when examined one by one. Further epidemiological studies are needed before we will be able to understand the population-level human consequences adequately.

Towards a Ban on Ecological Warfare

This article has focused on one particular weapon of ecological war, aerial spraying of herbicides. Other weapons exist, some of which could have even more severe consequences. Aerial bombardment, for the purpose of destroying agricultural capabilities, for example, probably had more of a long-term effect on Vietnam's agriculture than did the herbicide spraying. The particular weapon utilized is of less importance than the general principle. Ecological warfare, the purposeful disruption of an ecosystem on which a human population depends, is a very dangerous gamble. In one sense it is similar to other non-conventional warfare (e.g., biological or chemical): large segments of the civilian population are inevitably affected, whether by design or by accident. But ecological warfare seems to have another characteristic — its unpredictability.

It seems to me that there are very good reasons for calling for bans on nuclear, biological, and chemical warfare. The same reasons suggest the necessity of a ban on ecological warfare. But at least with the other forms of warfare, we can predict, if not the extent, at least the type of devastation involved. Waging ecological war is akin to dropping bombs, some of which are loaded with firecrackers, some with TNT, but where the bomber does not know which is which until after they explode. □



Environmental Articles from Science for the People

- "Fighting Pesticides on Long Island" by Ted Goldfarb and Dan Wartenberg, Vol. 15 No. 1, Jan/Feb 1983, pp. 18-24.
- "Nature, Natives, and Technology" an interview with Winona LaDuke, Vol. 14 No. 5, Sept/Oct 1982, pp. 24-28.
- "Cuban Science: Meeting the People's Needs" by Dick Levins, Vol. 13 No. 2, March/April 1981, pp. 29-33.
- "Powerline Assaults the Prairie" by Alice Tripp, Vol. 12 No. 5, Sept/Oct 1980, pp. 19-21.
- "Dumping for Dollars—Exporting Toxic Wastes" by Christopher McLeod, Vol. 12 No. 5, Sept/Oct 1980, pp. 27-28.
- "Vietnam War Legacy" by Scott Thatcher, Vol. 12 No. 5, Sept/Oct 1980, pp. 29-32.
- "The Pesticide Connection" by Paul Barnett, Vol. 12 No. 4, July/Aug 1980, pp. 8-10.
- "Cancer: Some Notes for Activists" by David Kriebel, Vol. 12 No. 3, May/June 1980, pp. 5-7.
- "Love Canal: Chemical Wastes Back Up" by Buffalo NAM Chapter, Vol. 11 No. 4, July/Aug 1979, pp. 14-19.
- "Society May Be Dangerous to Your Health" by Fran Conrad, Vol. 11 No. 2, March/April 1979, pp. 14-19.

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SEVESO UPDATE:

A Dioxin Disaster Seven Years Later

by Alessandro Liberati, Isabella Quenti and Annamaria Torriani-Gorini

Editor's Note: *In a cover article written by Paolo Strigini and Annamaria Torriani-Gorini six years ago, SftP reported on one of the worst environmental disasters in history: the chemical explosion and consequent dioxin contamination of Seveso, Italy. Today, Annamaria Torriani-Gorini joins two other authors to look at what has happened in Seveso since the explosion, and what, if anything, has been learned from the experience.*

Seveso, July 1983: A park, with plants and grass, will be ready in a short time for the children of this town to play in. It lies in the same area where dioxin contamination forced a mass evacuation seven years ago. Will Seveso call it "Dioxin Park"? No, the citizens and officials of the many small cities surrounding Seveso are begging for everyone in the world to forget, so they can all live their normal lives without the specter of contamination.

The *New York Times*, June 19th & 20th, 1983, brings home a new old fact! "Jersey Dioxin Plant ordered Shut." The title is strange: a plant producing dioxin? Of course not. They produce chemicals that add fragrance and flavor to a variety of products. The owner of the factory is the Givaudan Corporation, the very same corporation responsible for the explosion in Seveso, Italy in 1976. But this time the contamination is not in a crowded Italian town, but in a well-groomed New Jersey community, and only 500 feet from a public school with 230 children. Fifty workers have lost their jobs. Houses in the zone are losing their values. The dioxin contamination is limited, it is stated, and a tarpaulin cover may do the clean-up job fast and cheaply (\$150,000).

Alessandro Liberati is a physician working in Milan in the field of Epidemiology. This year he is a research fellow at the Harvard School of Public Health.

Isabella Quenti is an immunologist and research fellow at Children's Hospital, in Boston.

Annamaria Torriani-Gorini teaches molecular biology at MIT and is originally from Milan as well.

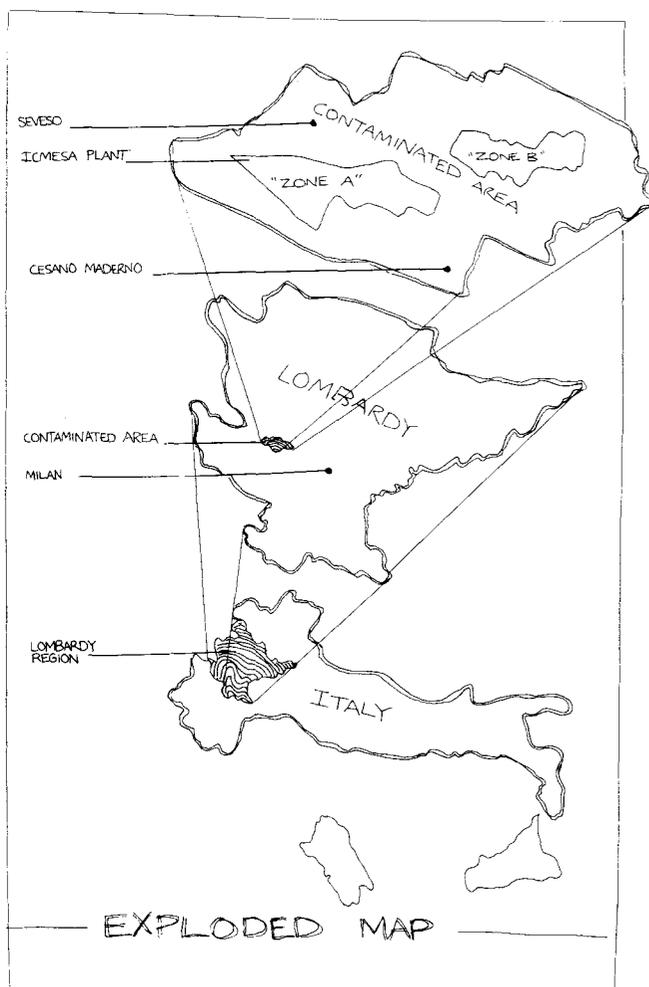
The same company, the same chemicals, the same political-social problems seven years later. The incident in Clifton, New Jersey cited above speaks to a severe crisis in our institutions. It also speaks to the importance of reviewing the story of Seveso's environmental disaster.

The Scenario in 1976

It was around lunch time in a small industrial town fifteen miles north of Milan. It was summer time (July 10th): the cherries and apricots were in season. Although the small town was thickly populated, with a total population of approximately 17,800, most of the houses had small, carefully tended gardens. Lunch in the garden under a shade of a colorful umbrella or a flowering wisteria or a grape vine was pleasant, especially on Saturdays when the factories were closed, the husbands at home, the children out of school and the smell of industrial pollution was not overpowering.

But on this July 10, in 1976, the families of Seveso had to leave their gardens and rush under cover. The smell was asphyxiating, and the air was thick with snow-white fumes. No one knew what had happened. Within five days many chickens, rabbits, insects and birds were dead, their carnage marking the white cloud's path. The inhabitants of Seveso were alarmed: would they die too?

An explosion at nearby ICMESA (Industrie Chimiche Meda Societa Anonima) had sprayed toxic fumes. ICMESA, in a letter addressed to Seveso authorities, explained that, "an unaccountable chemical reaction" had broken the safety valve. They added, "As we do not know the substances or their specific effects, avoid consumption of garden produce. The final product is also used for herbicides." Animals that had survived the initial effects of the explosion were slaughtered. The poison was concentrated in their fat and livers. Seveso's inhabitants panicked: would humans also accumulate the poison? On July 23, ICMESA officials assured Seveso residents that they had nothing to fear from the recent explosion. But such statements did little in the face of the immediate situation.



Seveso, and Cesano Maderno, small towns near Milan were contaminated by dioxin on July 10, 1976. The process of containing the spreading of this toxic substance was slow and inefficient.

The poison was dioxin ("la diossina") and its immediate effects were horrifying. Children playing in the gardens developed disfiguring and painful acne. Local vegetation withered. Hundreds of children were evacuated a week after the accident. And then the order came to evacuate the houses. No one wanted to abandon home and belongings. But they were ordered to do just that and to leave everything behind. Seveso was poisoned and empty: a toxic wasteland.

The 780 evacuated people were homeless and jobless. Many factories surrounding ICMESA closed. Trade was paralyzed, contracts cancelled, local industry destroyed. The army moved in with masks and gloves and boots. They entered the empty houses and threw everything from the windows and balconies: furniture,

baby carriages, bicycles, pots and pans. The din and disaster increased day by day. Next came the cleaning: soap and water spilled all over. The insoluble dioxin (.2 parts per billion or .2 micrograms per liter) was suspended in buckets of water and redistributed through the sewer into the rivers which flow to Milan. Soil, leaves and debris were collected in plastic bags by the thousands and deposited in empty logs. Fire, wind and rain also scattered the contaminated material.

On August 11th, pregnant women were told that dioxin is teratogenic: because they had been exposed to it, they risked giving birth to deformed babies, particularly if they were in the early stages of pregnancy. Although it seemed logical to abort, anti-abortionists are everywhere in Catholic Italy. Abortion has been accepted only very recently by law, and remains unacceptable in small communities. Only one public hospital was willing to help the women of Seveso with these matters. Religious people and the clergy saw in dioxin the hand of God.

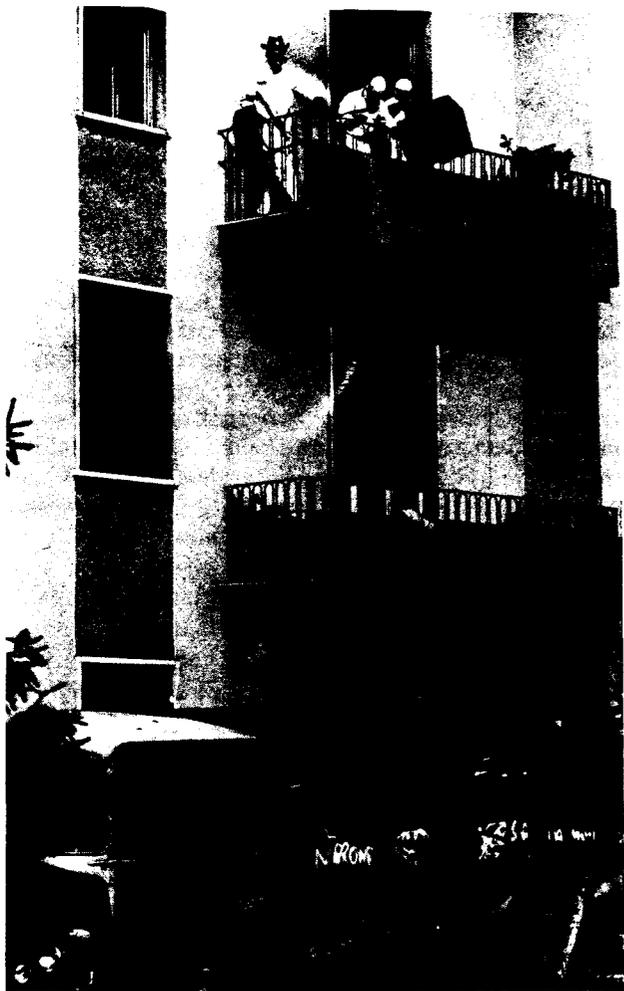
Whose Responsibility?

Someone had to clean up the mess. In August 1976, the Italian government granted approximately \$30 million to the Lombardy region for immediate emergency aid to victims of the disaster, but who would defray the costs to the Italian government? "Societas delinquere non potest" reads the Italian legal code. A *company* cannot be delinquent and thus cannot respond legally. Since corporate decisions are made by individuals, the people who make these decisions must be responsible for any damaging results.

The legal committee of the European Community applies the principle that groups of companies (i.e. multinationals) are a single unit financially and legally. Since ICMESA is a subsidiary of the Hoffman La Roche-Givaudan empire, that empire is liable for the explosion at ICMESA. The State Council of Italy estimated debts assumed by Givaudan at less than \$100 million. This sum was considered a minimal settlement: the real total value of the damages (including psychological ones) was impossible to assess.

On May 11, 1983, the trial against Hoffman La Roche finally began in Milan. The charges are disastrous negligence, damages to the population, and disregard of safety measures. The plaintiffs are several ICMESA workers, a group of private citizens in the polluted area, the trade unions, and two ecological groups. The public institutions, Regione Lombardia, and the mayors of the towns involved in the disaster did not take any action, effectively shirking their responsibility to defend and support private citizens against an industry responsible for a disaster in a public zone.

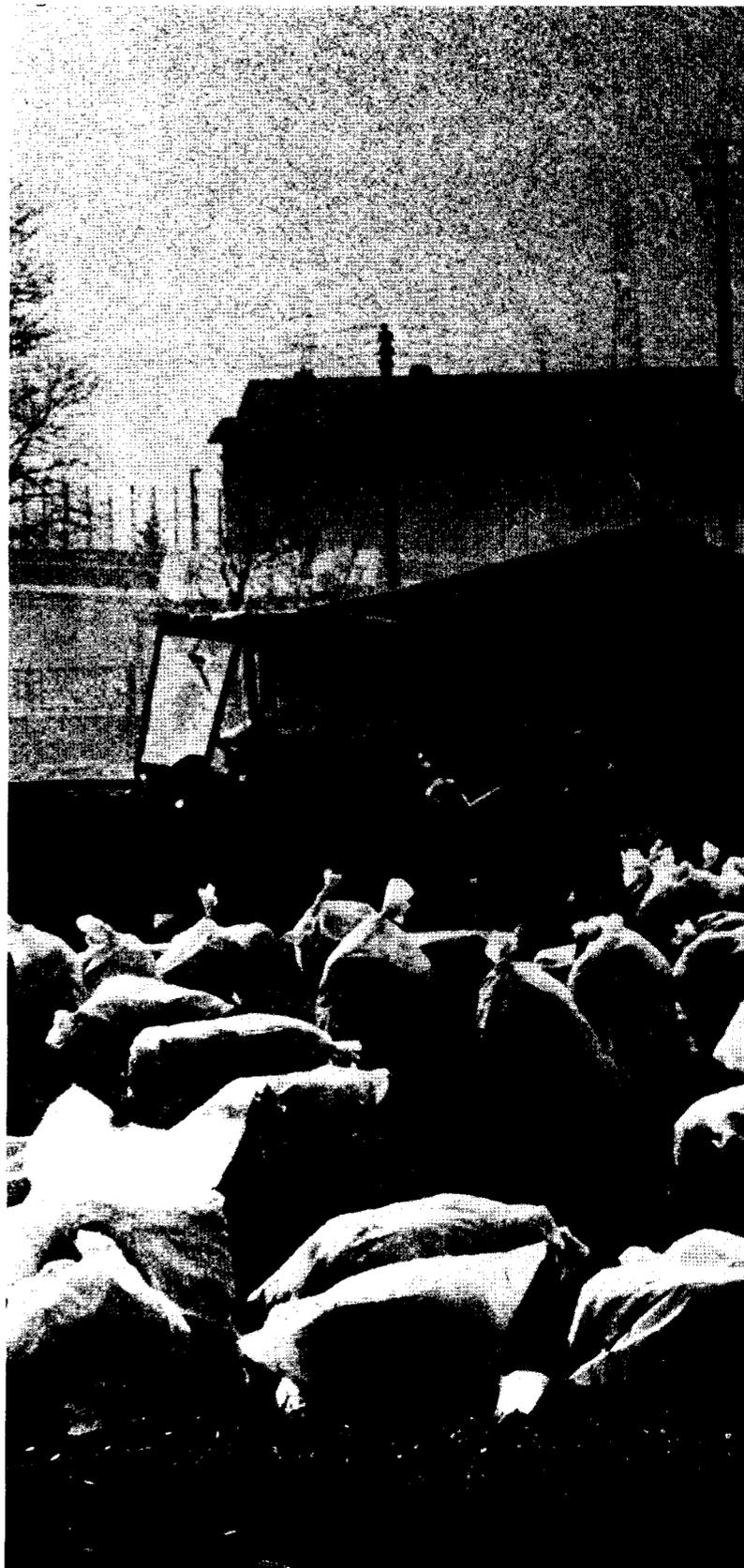
The defendants are five ICMESA directors: Guy Walvogel, president of ICMESA; Herwing van Zwahl, director of the factory at Meda; Giovanni Radice, another director of that factory; Joerg Anton Sambeth, technical director of Givaudan; Fritz Moeri, technical director and designer of the Meda plant. None of them

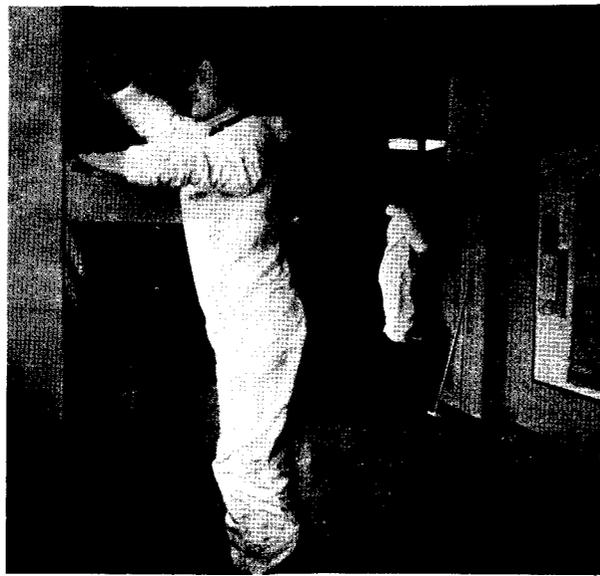
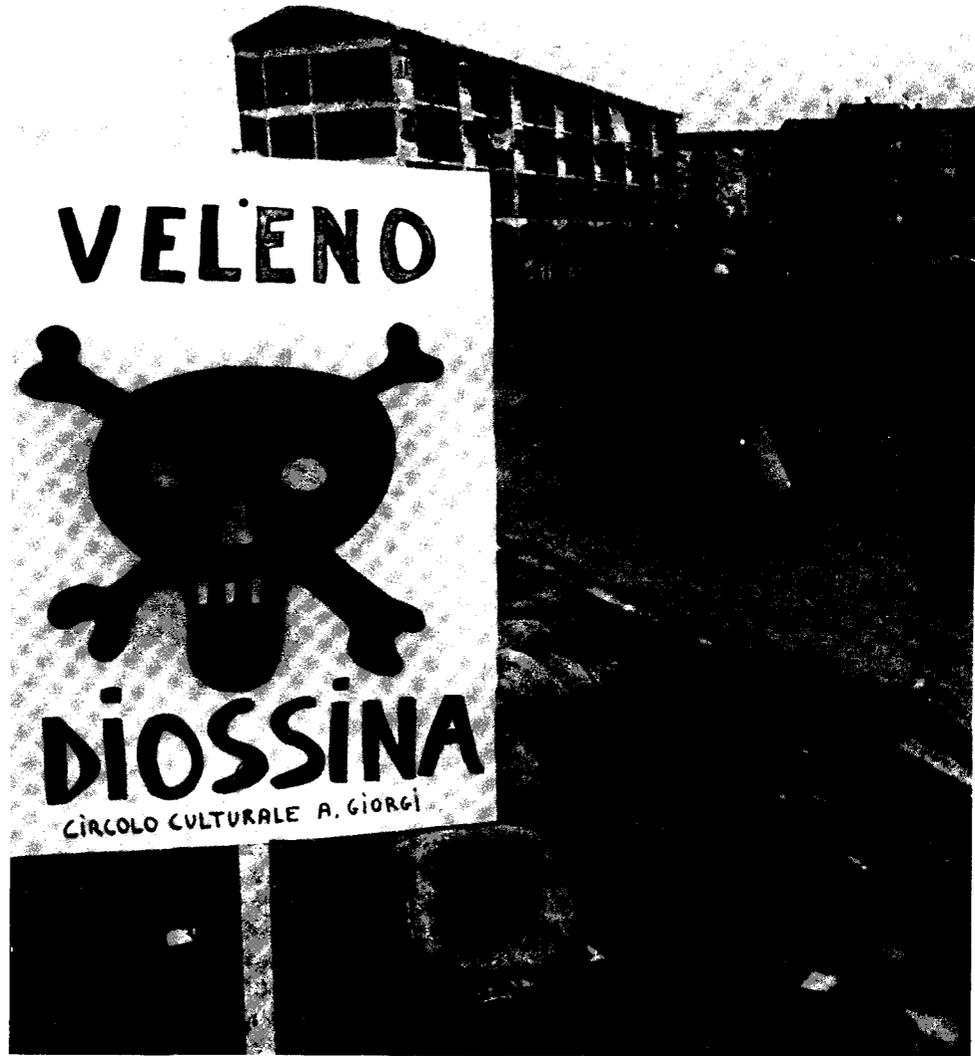


even bothered to appear at the trial. ICMESA in its defense is presenting the thesis that the explosion was due to an "unpredictable reaction." A number of experts from various universities are supporting this thesis. Also used in the case for the defense are alleged mistakes by workers and lack of supervision by several lower bosses. One of these supervisors was shot and killed by a group of organized killers, and so became a perfect scapegoat for the defense.

Hoffman La Roche justifies their disregard of the trial because the corporation has already done what it considers the most important task: it has paid off private citizens and public institutions. Those responsible for the disaster have thus determined the amount of compensation they would make to their victims, and ignored any legal claims. Will the people obtain justice through the legal system? Although the trial is still going on, it seems very likely that no compensation will be won.

One of the key questions is whether ICMESA was producing dioxin through criminal negligence. This has been particularly hard to ascertain because the contents of the reactor in Seveso at the time of the disaster remains a secret. After the "accident", Hoffman La





Upper left: Evacuation. The houses in the contaminated areas are emptied to allow clean up. Center: Clean up of areas A and B, heavily contaminated. The teams were mostly constituted of people lacking the required expertise for the job. Upper right: People still living in the contaminated areas after the explosion. Lower right: Clean up carried out with sponges and soap without adequate protection for the workers. (Notice in this photograph they do not even wear gloves.)

Roche collected the reactor's contents into 41 drums and took them out of the country. Later, they were reportedly discovered in an old slaughterhouse in Aisne, France. Finally, Hoffman La Roche has now brought them to Switzerland where the material will be incinerated at a temperature of about 1200 °C. With this final act, it will make it impossible to examine publicly the contents of the reactor, information that could be used in the trial to understand the causes of the explosion.

While the contents of the reactor have been unavailable for public examination, however, much information about the production cycle at ICMESA has come to light. ICMESA was producing a defoliant called trichlorophenol (TCP), using a modified form of a Givaudan-patented process. It was this modification of the process, designed to save money, that caused the production of dioxin. With little or no safety equipment, and all the reactions controlled by hand (see box for details), the ICMESA plant had only one safety valve in the reactor. In case of accident, it would spew directly into the atmosphere. This is probably exactly what happened in July 1976: a massive explosion instead of the everyday leak of the past twenty years.

Consequences of Exposure to Dioxin

Italy was unprepared for such an ecological disaster of industrial origin. In Italy, epidemiologic studies on a large and modern scale were instituted only in 1970 during a cholera epidemic in Naples. The lack of epidemiologic data on the effect of TCDD (dioxin) in humans created immediate difficulties in defining the observation plan at Seveso. Although vast amounts of data were in fact collected, much of the data was never fully analyzed and many studies remained incomplete. For example, no data is available to analyze mortality patterns or determine the incidence of cancer. The following is a summary of some of the results to date.

Chloracne is a syndrome characterized by the presence of facial lesions. In severe cases the lesions, caused by the skin's elimination of chlorinated compounds, may occur in other parts of the body and may be inflamed or pustular. After July 23rd, 1976, some 1600 subjects underwent examination in an outpatient dermatologic clinic. Since chloracne affected children in the greatest number of cases, subsequent dermatologic screenings of the school age population were performed. In addition to a number of adults diagnosed outside the screenings, 193 child cases were recorded. The symptoms were more severe in 1976 and diminished gradually until 1978. Although most cases of chloracne disappeared, the disfiguring symptoms persist in some

The TCP Cycle at ICMESA

To produce TCP (a defoliant) ICMESA followed a modified version of the Givaudan-patented process. It required 22 hours in 4 steps which were carried out by one skilled worker and one helper at each shift. The work started at 6 a.m. and the two workers initiated the alkaline hydrolysis of tetrachlorobenzene (TCB) into sodium phenate (Fig. 2 Step 1). This entailed opening 27 bags of 40 Kg each of caustic soda (NaOH), pouring the material through the port-hole of the reactor, and adding 2000 liters of ethylene glycol and 1000 liters of xylene. To this the workers then added 40 bags of 50 Kg each of TCB. Because the powder was poured by hand, there is little doubt that the workers were inhaling a good breakfast of it.

At ICMESA, where the Givaudan process was modified in order to save money, the amount of ethylenglycol was decreased and it was redistilled during the reaction. The sodium TCPenate produced was kept in the reactor at above 150°C during this recycling. Since dioxin is formed by condensation of TCP at high temperature (Fig. 3), this modification provoked a high contamination of dioxin.

This contaminated product was further processed to TCP (Step 2 Fig. 2) by adding hydrochloric acid(s). To obtain a pH3, the input of hydrochloric acid was controlled by hand: a stick was immersed in the reactor and pH papers were used as indicators. Givaudan could not even supply automatic titrator! Since acidification is exothermic, the worker had to control the addition of acid in order to prevent overheating and a fast boiling. This process too was judged by touch.

The melted dense syrup TCP (melting point 63-65°C) was transferred to the reactor and washed with water (Step 3). Finally, (Step 4) the TCP was distilled at 80°C. The so-called "pure" TCP was poured through a faucet into barrels of 200 liters which were manually positioned and transported. The fumes of the hot TCP went to the lungs of the workers and through the one "safety valve" to the atmosphere outside.

very serious cases. Since no systemic observation of the adult population was made, figures on the incidence of chloracne are incomplete.

Observation of **spontaneous abortion** carried out until 1978 showed a temporary rise in the abortion rate in zones A and B (see map). The majority of cases occurred in zone B. A peak number of spontaneous abortions occurred about one year after the ICMESA explo-

sion, and the number returned to the baseline rate in the three subsequent quarters (Fig. 4). Considering the small number of cases (thirty-eight abortions out of one hundred and seventy-nine pregnancies between July 1976-December 1977), the lack of reliable data for the period preceding the explosion, and the unknown level of the population's exposure to the dioxin, no statistically significant conclusions can be drawn from the temporary increase.

The search for **birth defects** among babies born to Seveso residents after the explosion has been fairly complete. In 1978, a centralized registry was implemented in the area, replacing the old system of recording birth defects. Table 1 shows the total number of defects recorded by both systems. The table clearly shows that after the explosion even the old system registered a dramatic increase in the number of malformations; it is impossible, however, to estimate the impact of increased awareness by physicians working in the disaster area on these statistics. A declining trend appears in the number of non skin-related birth defects after 1978 (Table 2) This declining trend may indicate a progressive return to a normal level of birth defects after a peak period due to pollution. If confirmed in the years to come, the trend would support similar evidence coming from Vietnamese studies.*

Four investigations into **neurological damage** possibly caused by the explosion have been conducted on the zone A population (see map). The first investigation, in 1977, included 470 people; the second, in 1978, included 308; the third, in 1980, included 50; and the fourth, in 1981, included 470. Subjects were examined according to a standard protocol that required a medical history questionnaire, a clinical examination and an electrophysical investigation. No acute polyneuropathy was revealed. In the first and second investigations a slight, non significant excess of polyneuropathy was found in the heavily-exposed zone A population. In the last examination, the excess disappeared. The most likely explanation seems to be that exposure to dioxin caused slight neurological abnormalities that tended to decrease after 1977.

Lessons from Seveso

The results of six years of observation at Seveso should inspire careful and continuing investigation, rather than assurances that nothing serious has happened. Different evaluations of the whole plan and of each of its parts have been made by each investigator.

*Recent studies in Vietnam have found long-term environmental damages and a possible rise in birth defects from U.S. spraying of Agent Orange. At a recent conference in Ho Chi Minh City several Western scientists examined reports of epidemiological studies conducted by Vietnamese scientists. (See John Vandermar's article in this issue.) The results brought "impressive" evidence of an increased incidence of congenital abnormalities among children whose fathers



Contaminated animals are removed for disposal.

Many of them think the observation has failed due to political pressure to downplay the danger of dioxin. Some attribute the failure to the confusing information given the public. The turmoil of the days immediately following the explosion, together with the lack of an overall strategy for observation resulted in loss of information essential to long-term studies.

Lack of strategy for observing the effects of chemical disasters has been a problem not only at Seveso or in Italy. A recent critical review of the work of the Atomic Bomb Casualty Commission of Japan, stresses the need for research activities that "represent an adaptive process dependent on many external factors." The review suggests an effective strategy for coping with environmental disasters:

1. Devise an adequate strategy early;
2. Register or identify the affected population as soon as possible, taking particular care to include all the identifiers on which follow-up may depend;
3. Determine the parameters of exposure in the best

were exposed to Agent Orange during the Vietnam War. The survey involved 40,000 families in North Vietnam, where women were not exposed. Women in South Vietnam were directly exposed and showed increased evidence of birth defects (deformities of the neural tube, of the sensory organs and of limbs.) These Vietnamese documents support the tentative results obtained in Seveso on a much smaller scale.

possible way with emphasis on objective physical measurement;

4. Employ a cohort approach with a clear plan for making statistically powerful comparison to identify and to measure effects either in dose-specific fashion or in exposed vs. more exposed comparison;

5. Evaluate carefully the potential value and cost-effectiveness of alternative end-points, particularly mortality and defects;

6. Plan staffing patterns to provide not only excellence of leadership and scientific performance, but also continuity;

7. In operations of long duration efforts should be made to sink deep into local roots.

These methodological proposals should interest public institutions. In Seveso, immediately after the accident, the vast majority of the population took active part in public debates and demonstrations. Residents solicited action by administrators and gathered adequate information about the health-related problems. During the emergency phase, conflicting proposals generated open discussions. This participation progressively tapered off. Two major factors may have been responsible for the local population's diminished interest: they are the roles played in the Seveso history by private industry and public institutions.

Hoffman La Roche issued a powerful combination of confusing information and large, well-advertised indemnities to needy families. By obscuring the nature and causes of the accident while simultaneously making themselves appear generous, Hoffman La Roche gradually transformed public opinion. Regime Lombardia began to appear somehow responsible for the disaster, rather than as the natural representative of the victims of it.

And as for the public institutions, each successive administrator and scientist held different opinions of the accident; thus conflicting actions were frequently taken. The original decision to clear out zone A resulted more from pressure by public opinion; and the media than from deep conviction of real danger. After the emergency phase of the explosion was over, the public began to perceive that the public institutions took more care in compromising with Hoffman La Roche than they did in defending the population and the environment. This lack of confidence in Seveso's public institutions has become a prevalent attitude, and is, in part, the focus of the current trial.

By July 1983, seven years after the explosion, Seveso has recovered at least in part. Zone A, around ICMESA, was cleaned up by opening a huge concrete lagoon with water-tight walls into which some of the contaminated material (dead animals, leaves, soil, destroyed houses) was dumped. The lagoon was then sealed shut and covered with fresh soil. Cleaning and recovery of the rest of zone A is under way. A second lagoon has been opened for the rest of the waste. This lagoon will also be hidden from view. It is here that the park with plants and grass will stand, so that children

can play in the vicinity without contracting chloracne (if the pit doesn't leak).

Was the reaction to the ICMESA explosion at Seveso too violent? Is dioxin really dangerous? An editorial about waste management in *Science* magazine recently stated: "The reality is that the hazard to public health from the waste sites is trivial in comparison to the danger from cigarettes." The author of this statement may well be statistically accurate. But whereas concerned individuals can cut down on cigarette smoking, the United States government has little power over tobacco growers or chemical plants.

Major producers of defoliants have been concerned about the contaminating aspects of TCDD for almost twenty-five years. They have held meetings kept secret from the public, press and possibly from the government. In these meetings they have presented very upsetting results obtained during experiments on animals in their excellent research laboratories. The secrets were kept to avoid government regulations and public outcry, not to prevent any danger to the public. This is the sort of voluntary corporate monitoring advocated by the current administration.

Out of the turmoil of Seveso and ensuing problems with dioxin, two facts emerge very clearly: dioxins are dangerous and are of no use to anyone. What make the dioxin issue unclear is that for the chemical giants, as well as for the health branches of the United States government, health hazards like chloracne and birth defects do not constitute sufficient reason to cease production of a chemical. If you are disfigured by chloracne for years or for life it is none of their business: the chemical is not dangerous. The laws to preserve a clean environment exist, but who is enforcing them? Who is controlling the people in control? The problem is not with the victims' reaction. It is with the failure of private corporations and public institutions to deal honestly with problems like dioxin. □

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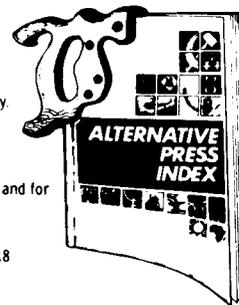
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REAGAN'S NUCLEAR PROLIFERATION POLICIES

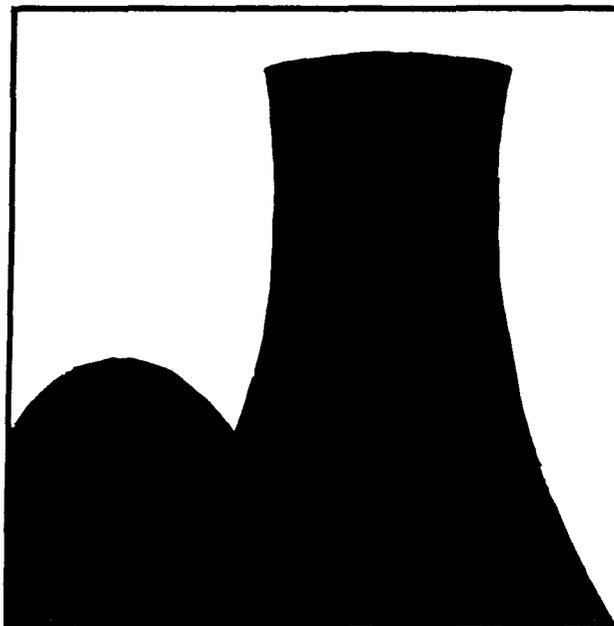
by John Abbotts

In April 1977, Jimmy Carter announced his intention to limit nuclear weapons proliferation by limiting the spread of plutonium — material that can be used to make atomic bombs — from commercial nuclear reactors. Carter planned to delay the development of the breeder reactor, which both uses and produces plutonium, by terminating the Clinch River breeder reactor, a federal demonstration plant in Tennessee. Carter also sought to “defer indefinitely” the nuclear fuel reprocessing activities which would recover plutonium from commercial reactors,¹ an extension of President Gerald Ford’s policies. Ford had announced in October 1976 that the U.S. should delay the commercial implementation of reprocessing, and would seek an international moratorium on the export of reprocessing and uranium enrichment technologies, technologies which could contribute directly to the manufacture of bombs.²

But in October 1981, nearly five years to the day after Gerald Ford’s announcement, Ronald Reagan made a dramatic reversal of the policies of both the Democratic and Republican administrations which preceded him. Domestically, the Reagan administration lifted the ban on commercial reprocessing, and its energy budget included funds for construction of the Clinch River breeder (although Congress just cut the funding for this economic monster). Internationally, Reagan had earlier undercut his alleged “nonproliferation” policies by announcing that he would not necessarily oppose commercial plutonium activities of other nations. Then, in June 1982, the Reagan administration signaled its willingness to discuss enrichment and reprocessing exports.³

The Reagan administration’s actions are influenced by a desire to shore up the sagging atomic power industry, but the result will also be to enhance the dangers

John Abbotts, a former naval nuclear engineer, lives in Seattle. His articles have appeared in the Bulletin of the Atomic Scientist, The Nation, and other publications. He is also co-author with Ralph Nader of The Menace of Atomic Energy (W.W. Norton and Company). The material in this article is taken from a longer paper, presented at the International Student Pugwash Conference on Science, Technology, and Global Responsibility, in Ann Arbor, Michigan, June 1983.



of nuclear proliferation in an already unstable world. These deeds have made a hollow campaign promise of Reagan’s claim during the debate with Jimmy Carter that trying to halt proliferation “would be a major part” of Reagan administration policies.⁴ Instead, it appears that the White House has returned to the dangerous idea, in vogue during the Nixon-Kissinger years, that “nuclear proliferation in the long run was pretty much inevitable”;⁵ and, with its deference to corporate interests, the Reagan administration has all but made explicit the attitude that U.S. companies might as well make a buck selling reactors in the process.

The Domestic Atomic Industry

President Reagan’s failure to appreciate nonproliferation issues is consistent with the positions he took as candidate Reagan, before the debate with Carter. Domestically, Reagan has followed the Republican presidential platform, which favors development of nuclear reprocessing and is lax on proliferation issues.⁶ During the primary campaign, he criticized any U.S. role to inhibit proliferation, noting that, “I just don’t think it’s any of our business” whether Pakistan or other nations develop atomic weapons.⁷

Moreover, Ronald Reagan’s understanding of the connection between commercial atomic power and nuclear proliferation may be limited to what he hears

from the atomic industry and its apologists in the executive branch. When aides informed him that the Israeli air force had bombed an Iraqi reactor, Reagan's reported response was, "By golly, what do you suppose is behind that?"⁸ As he later acknowledged in public, the Israeli government defended its action by claiming that Iraq planned to fashion the plutonium, a byproduct of reactor operation, into atomic bombs.

One issue which Reagan probably understands all too well is that the atomic industry, facing serious economic problems at home, will have to depend more and more on foreign markets if it is to stay alive. Practical marketplace forces have curbed the nuclear industry's growth: atomic power will not save oil, is not needed, and is crumbling from its own economic defects.

The nation's major energy problem is oil consumption, not electricity — which is the only form of energy atomic power can supply. Nuclear power contributes only 13% of electricity production, representing 4% of the nation's total energy use. At the same time, the electrical sector accounts for only 6% of the nation's oil consumption.⁹ A good portion of that oil goes to plants used for peak loads which must be started and shut down quickly — a requirement nuclear plants cannot fulfill. So even a maximum nuclear development program would replace only a few drops in the oil import bucket. Serious oil saving measures must focus on the transportation sector, which accounts for about 60% of national oil consumption.¹⁰

Even if nuclear power plants could save oil, they would not be necessary. In 1982, nationwide electrical generating capacity was 42% beyond even the highest electrical load for the year.¹¹ This is far more than any prudent reserve margin necessary to compensate for unanticipated demands and maintenance. Utility ratepayers suffer from this overcapacity, since they ulti-

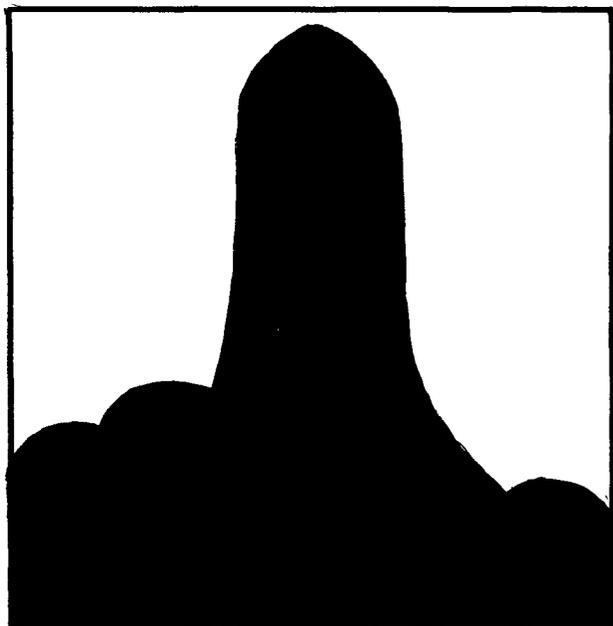
mately pay construction costs and interest on money borrowed for construction, whether power plants produce electricity or sit idle. Utility executives have been forced to cancel and defer many nuclear plants because new electrical capacity of any type is simply not needed.

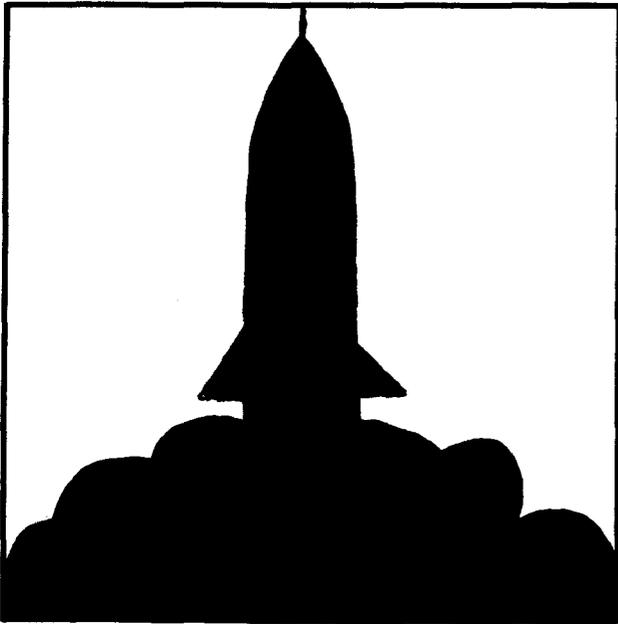
In addition, the Three Mile Island accident of March 1979 has amply demonstrated the economic drawbacks of atomic power. General Public Utilities (GPU), the holding company owning the plant, maintained property damage insurance of \$300 million, the maximum then available, on the crippled Three Mile Island (TMI) Reactor Unit 2. Estimated costs of repairing and decontaminating the plant, set at \$140 million two weeks after the accident,¹² have escalated rapidly. Damage estimates rose to \$400 million a few months later,¹³ than to \$1 billion in November 1980.¹⁴ Although the latter figure represents about 150% of the cost to *build* the reactor, future estimates are likely to be larger rather than smaller.

General Public Utilities has frequently complained that it faces bankruptcy due to financial difficulties resulting from the accident. To solve its self-inflicted economic problems, the company has turned not to its investors, but to taxpayers. In December 1980, GPU filed a claim with the Nuclear Regulatory Commission — which amounts to a back-door application for taxpayer subsidies — for \$4 billion in damages from the accident.¹⁵ In October 1981, after heavy GPU lobbying, the Reagan administration asked Congress to appropriate \$123 million for the TMI cleanup.¹⁶ If General Public Utilities has its way, the costs of the Three Mile Island cleanup will ultimately be borne by individual citizens, either as electricity ratepayers or as taxpayers.

It may be many years before scientists can accurately assess the health effects of the radioactivity released during the TMI accident, but as far as the atomic industry is concerned, the most important long-range effects will be economic. GPU's financial problems, it must be recognized, stem from an accident representing a small portion of the catastrophic potential of a nuclear power plant. Faced with the real possibility that such a "minor" accident could cause damages exceeding available property insurance and threaten a company with bankruptcy, any utility executive should have serious second thoughts about nuclear power investments. In addition, Three Mile Island has demolished the atomic industry's propaganda statements on the economic benefits of nuclear energy. The accident has demonstrated that atomic power is a very expensive way to produce no energy at all.

Thus, Reagan's sermon to developing nations that they must "believe in the magic of the marketplace,"¹⁷ comes into sharp conflict with his sympathy for the nuclear industry. If atomic power is to survive the marketplace forces that might otherwise destroy it, the Reagan administration realizes that it must find new ways to subsidize the industry at home and dump this hazardous, expensive technology abroad.





Reagan Administration Policies

It was therefore not surprising that after fumbling news conference questions on the Israeli bombing of Iraq's reactor, Reagan in July 1981 announced a "non-proliferation" policy which Jeremy Stone, director of the Federation of American Scientists, characterized as "rhetorical cover for the desire to sell reactors abroad."¹⁸ The Reagan administration program included a promise to propose laws and regulations to ensure that the United States would remain a "reliable supplier" of atomic power plants. A State Department memo obtained by the *Washington Post* in October 1981 included some suggestions on how this promise might be kept:

- all export licensing functions of the Nuclear Regulatory Commission would be transferred to the State Department;
- repeal would be sought for existing provisions of law that cut off nuclear aid, as well as military and economic aid, to nations that move toward producing atomic weapons for the first time;
- the administration would move to weaken laws requiring nations to accept international inspection in order to continue buying nuclear material from the U.S.¹⁹

The administration backed down from these proposals, all of which would relax existing nonproliferation guidelines, after they were made public. But the administration's biases had become evident: Ronald Reagan's program is reduced to a ludicrous claim that he would seek to inhibit proliferation by proliferating the atomic power plants which can produce bomb material.

The administration's determination to export atomic power has been expressed by W. Kenneth Davis, a former executive in charge of Bechtel Corporation's nuclear operations, whom Reagan appointed as deputy secretary of energy. At an industry conference in April 1982, Davis assured his former colleagues that, with regard to sales overseas, "U.S. officials will be prepared to go anywhere they are needed to help the industry . . . who should expect nothing less from their government."²⁰

The Reagan administration has maintained foreign markets by allowing a set of questionable nuclear deals involving American corporations. American companies arranged shipments of non-U.S. nuclear fuel to South Africa. Similar nuclear deals have involved Brazil and Argentina, among others.

The Brazilian nuclear fuel was purchased for a Westinghouse-built reactor which began operation in 1982; Argentina will use the heavy-water plant to operate a non-U.S. reactor. All of these recipient nations including the apartheid regime of South Africa, have refused to forswear the development of atomic weapons by signing the international Nuclear Non-Proliferation Treaty. Were it not for the domestic restrictions of the U.S. Nuclear Non-Proliferation Act, which Congress passed in 1978, the Reagan administration might already have allowed direct sales of nuclear fuel and technology to these countries, and others.

Given the Reagan administration's sympathy for the atomic industry, its softness on government interference in the form of the Export-Import Bank becomes understandable. The federal Ex-Im Bank offers loans at very favorable terms to nations which import expensive, high-technology U.S. products — such as nuclear reactors. Ex-Im loans and loan guarantees to the tune of about \$7 billion have helped finance reactor sales abroad.²²

In April 1981, as part of his desire to reduce federal involvement in banking endeavors, Reagan's budget director David Stockman planned to cut Ex-Im loans, which primarily go to a few large companies, by about 20 percent. But after corporations such as Boeing, Westinghouse, and General Electric lobbied against these cuts, the Reagan administration flip-flopped and allowed Congress to leave the Bank's funding at previous levels.²³

The Export-Import Bank figured in another outrage in the Reagan administration. As his assistant secretary of state for oceans and international environmental and scientific affairs — a position entailing responsibility for nonproliferation policy — Reagan appointed James L. Malone, a Washington, D.C. lawyer whose firm had represented foreign companies owning nuclear power plants. The Senate confirmed Malone only after he promised that he would not become involved with any of his former clients. But in May 1982,

the Senate Foreign Relations Committee called Malone before it to explain why, in his capacity as assistant secretary, he had lobbied for an Ex-Im Bank loan to the Taiwan Power Company, one of his former clients. Taiwan Power sought the \$850 million loan to construct two nuclear power plants.²⁴

In summary, the Reagan administration's plans to throw money at plutonium nuclear fuel will do little to solve the massive economic problems of the atomic power industry. The administration's desire to encourage atomic power exports may assist the industry by providing foreign markets for the dumping of hazardous, uneconomical nuclear plants. But this policy will also require sizeable taxpayer subsidies, and will encourage nuclear proliferation by spreading the means of producing bomb material. The Reagan administration program is clearly more likely to advance atomic proliferation than to curb it.

A Sensible Nonproliferation Policy

As has been illustrated, the Reagan administration's policies mark a dramatic change from even the Carter and Ford administrations, towards increasing, unrestrained exportation of nuclear fuel and technology. With the examples from these administrations as a background, one might properly ask how an effective nonproliferation policy might be established.

In fact, the first steps towards an effective policy have been outlined by Amory and Hunter Lovins, the physicist-lawyer couple affiliated with Friends of the

Earth, in their book *Energy/War: Breaking the Nuclear Link*. Central to their advice is the recognition that "every form of every fissionable material in every nuclear fuel cycle can be used to make military bombs, either on its own or in combination with other ingredients made widely and innocently available by nuclear power."²⁵ As the Lovinses note, as long as governments bound their options by seeking to limit the spread of nuclear bombs without inhibiting the expansion of commercial atomic power, the proliferation problem will remain essentially insoluble.²⁶

Thus, rather than devising new schemes to subsidize the costs of the atomic industry, governments should start on a road to fiscal responsibility and reduced world tensions by allowing the natural economic demise of nuclear power. Amory and Hunter Lovins argue that if the United States were to renounce further taxpayer support for the expiring atomic industry, and to publicize the beneficial economic effects of doing so, this would have salutary effects on the proliferation problem: other nations would be encouraged to follow such a U.S. example for economic reasons alone. Moreover, any nation which continued to pump government funds into atomic activities clearly recognized to be of dubious economic value would reveal the "unambiguously military" intentions of its nuclear programs.²⁷ The resulting isolation of such nations, along with the pressures of world opinion and economic self-interest, might then work to reduce the number of potential bomb-producing nations. □

REFERENCES

1. *The National Energy Plan*, The White House, April 1977, p. 70.
2. "Nuclear Policy Statement by President Gerald R. Ford, October 28, 1976," printed in Michael J. Brenner, *Nuclear Power and Non-Proliferation* (Cambridge University Press, New York, 1981), Appendix D, p. 272.
3. John Walsh, "Reagan Changes Course on Nonproliferation," *Science* 216, 1388, June 25, 1982.
4. "Transcript of the Presidential Debate Between Carter and Reagan in Cleveland," *New York Times*, October 29, 1980, p. A27.
5. Brenner, *Nuclear Power and Non-Proliferation*, p. 17.
6. "Pronuclear Republicans Criticize Carter for Tarapur Shipments," *Nucleonics Week*, July 17, 1980, p. 2.
7. Robert Lindsey, "Reagan Says America Should Not Bar Others from A-Bomb Output," *New York Times*, February 1, 1980, p. A12.
8. *Life: The Year in Pictures*, January 1982, p. 31.
9. *Monthly Energy Review*, U.S. Department of Energy, Washington, D.C., May 1983, pp. 6, 25.
10. *Ibid.*, pp. 6, 24.
11. "33rd Annual Industry Forecast," *Electrical World*, September 1982, p. 83.
12. Roger Smith, "Insurance Pools Roughly Estimate Three Mile Damage at \$140 Million," *Nucleonics Week*, April 12, 1979, p. 3.
13. "TMI-Cleanup Hits \$65 Million and Counting," *Nucleonics Week*, August 30, 1979, p. 4.
14. John Emshwiller, "As Three Mile Island Clean-Up Costs Soar, GPU and Regulators Turn to Uncle Sam," *Wall Street Journal*, November 14, 1980, p. 31.
15. John Emshwiller, "GPU Seeks \$4 Billion from NRC, Asserts a Lack of Regulation at Three Mile Island," *Wall Street Journal*, December 9, 1980, p. 10.
16. Arlen J. Large, "Battle Opens on Paying \$1 Billion Cleanup Bill for Three Mile Island," *Wall Street Journal*, October 21, 1981, p. 1.
17. Art Pine, "Reagan Voices 'Strong' Support for IMF, World Bank Despite Recent U.S. Criticism," *Wall Street Journal*, September 30, 1981, p. 5.
18. John Walsh, "Reagan Outlines Nonproliferation Policy," *Science* 213, 523, July 31, 1981.
19. Don Oberdorfer, "Administration Moving to Loosen Laws on Curbs for Nuclear Weapons Abroad," *Washington Post*, October 11, 1981, pp. A1, A6.
20. Christopher Joyce, "Nuclear Commerce in the 80's," Report on the conference held April 28-30, 1982, Special Supplement, *Nucleonics Week*, p. S-5.
21. Edward J. Markey, with Douglas C. Waller, *Nuclear Peril* (Ballinger Publishing Company, Cambridge, Mass., 1982), p. 105.
22. Art Pine, "Export-Import Bank May Avoid Budget Ax and Get Larger Role," *Wall Street Journal*, July 22, 1981, pp. 1, 27.
23. Judith Miller, "Senate Questions Sea-Law Negotiator on Lobbying," *New York Times*, May 16, 1982, p. 21.
24. Amory B. Lovins and L. Hunter Lovins, *Energy/War: Breaking the Nuclear Link* (Friends of the Earth, San Francisco, 1980), p. 28.
25. *Ibid.*, pp. 4, 5.
26. *Ibid.*, p. 36.

An Analysis of the Freeman-Mead Controversy

SYMBOLS OVER SUBSTANCE

by Rae Goodell

Last winter Margaret Mead, who during her lifetime had been an eminent anthropologist and a favorite with the media, took an astonishing drubbing from the press. The ironies of this particular incident offer some important insights into the media's coverage of science-related material.

On January 31, 1983, *The New York Times* announced on page one that Margaret Mead's best-selling *Coming of Age in Samoa* had been seriously challenged in a new book by Australian anthropologist Derek Freeman, *Margaret Mead and Samoa: The Making and Unmaking of an Anthropological Myth*. According to the *Times*, the new book contended that Mead's inexperience, her failure to live with the Samoans, and particularly her political biases rendered her conclusions about Samoa largely invalid, a "wholesale self-deception" on a scale unprecedented in the history of the behavioral sciences. In contrast to Mead, the *New York Times* reported, Freeman found the Samoans to be a competitive, violent, jealous people among whom adolescence was stressful and sex repressed. The book, which was soon to be published by Harvard University Press, raised important questions, according to the *New York Times*, not only about Mead's work, but also about the role of nature and nurture in human behavior and about the integrity of scholarship in the behavioral sciences.

Offering celebrity, controversy, color, and credibility, the story spread quickly, sometimes appearing in a half dozen forms in the same newspaper — the *New York Times* for one — first as news, then perhaps a followup, an interview with Freeman, an editorial, coverage of a scientific seminar, a feature on Samoa, or a book review. Headlines scattered across newstands read

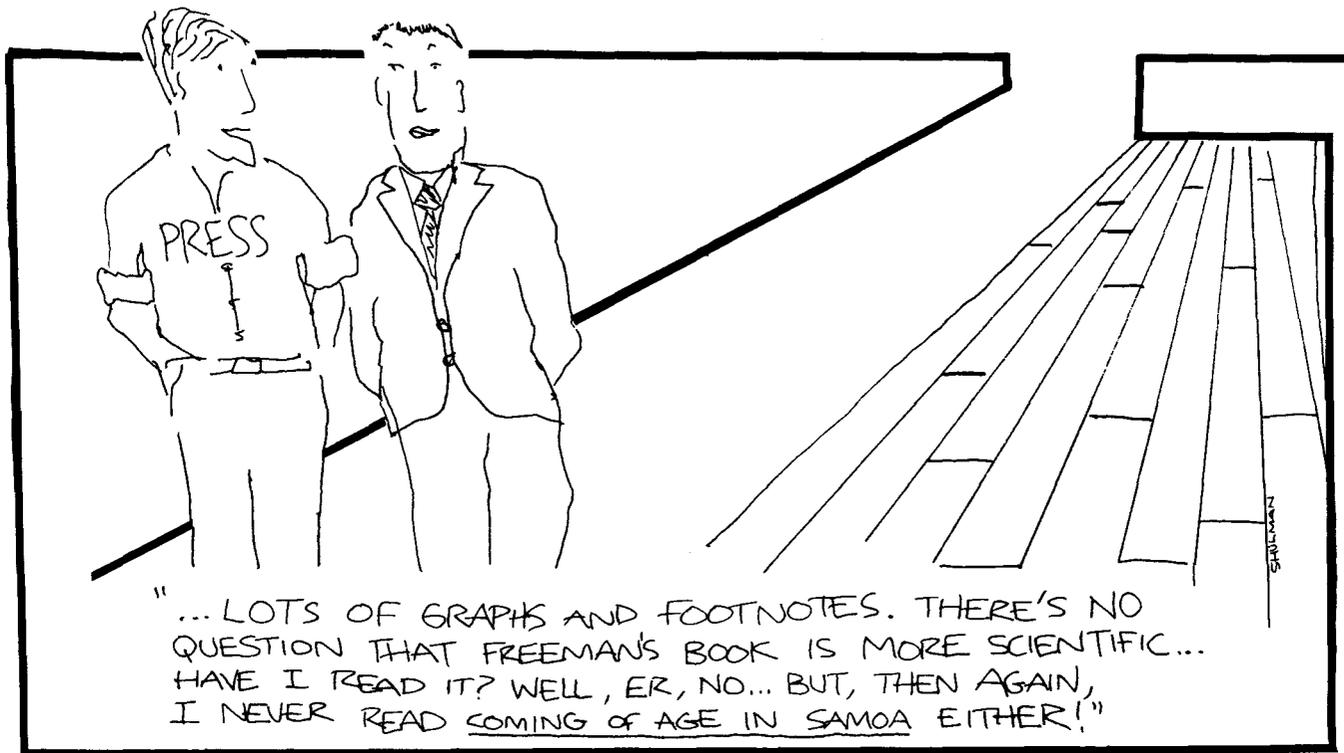
"Sex and Violence in Samoa," (*Life*, May 1983), "Bursting the South Sea Bubble," (*Time*, 2/14/83), "Shooting Down Mead's Classic Myths," (*Boston Globe*, 3/11/83), and "Trouble in Paradise" (*New Republic*, 3/28/83).

From the beginning, Freeman was usually given the benefit of the doubt. The original *New York Times* story, calling him "Professor Freeman" and Mead "Miss Mead," devoted approximately three of its 40 paragraphs to pallid defense of Mead from her colleagues. The coverage settled comfortably into a mold that depicted Freeman as a conscientious scientific expert who had produced a scholarly, meticulous study that exposed serious problems in the work of a romantic, inexperienced Margaret Mead.

Expanding on Freeman's attack on Mead, the press had a heyday. *Time's* story began: "On Aug. 31, 1925, with romantic South Sea tales of Robert Louis Stevenson filling her head, Margaret Mead, 23, stood at the rail of a Matson liner steaming into the lush port of Pago Pago, Samoa." (2/14/83, p. 68) *Discover*, after dredging up the old backbiting gossip that circulated while Mead was alive — for example, a Florida governor called her a "dirty old lady" for advocating legalization of marijuana — avowed that "Mead was very young when she first decided to visit Samoa, and very inexperienced. Twenty-three years old and deeply influenced by Franz Boas . . . she badly wanted to impress her mentor . . . After nine months of watching, asking, nosing about, eating fish and tropical fruit with her fingers, and dressing in the local garb, she felt that she had enough material to present her conclusions to Boas." (April 1983, p. 28)

Even the illustrations in magazine articles tended to underscore the juxtaposition of the level-headed Freeman and the fluffy-headed Mead. *Discover* featured

Rae Goodell teaches in the writing program at MIT.



sketches of a young Mead taking notes as Samoan youngsters gossiped and kissed, also reclining in a Samoan canoe, and getting instructions from Boas. Freeman, on the other hand, sits contemplatively at his typewriter.

How could Margaret Mead's stock with the press have fallen so far so fast? For one thing, reporters had always been ambivalent about their frequent and favorable coverage of Mead. There is a feeling among reporters as well as scientists that there is something a little unseemly about a scientist who welcomes popular attention. Such a scientist is assumed to have sold out in some sense, and to have sacrificed his or her ability to be a good scientist. If Freeman had been attacking a less celebrated scientist — say, Ruth Benedict — it is hard to imagine that he would not have been greeted more skeptically. Besides, the press wanted to believe; the downfall of a popular hero makes a great story.

Freeman had a second advantage: both he and his book had an air of scientific respectability. Freeman presented himself in interviews as patient, objective, methodical, and — let's face it — male. "He seems much more the scientist," explained *Discover*. Much was also made of the scholarly appearance of Freeman's book, such as its graphs and tables and, as the *Times* noted, "55 pages of notes." Continues *Discover*, "... his book seems completely and thoroughly documented [and to] ... convincingly debunk many of Mead's observations." As the *Boston Globe* put it, "While Mead wrote rhapsodically of an Eden-like Samoa of brown-skinned natives enjoying free sex under the palm trees untouched by war and jealousy and neurosis, Freeman carefully documents his assertion

that Samoan culture is intensely competitive." (3/11/83, p. 36) It also impressed the press that Freeman had immersed himself in Samoan culture, receiving an honorary title as an adopted son of a chief, while Mead had lived in quarters attached to the home of an American family.

In short, Freeman offered the press more of the superficial trappings of science, from footnotes to honorary native titles, and much of the press fell for the illusion.

And illusion it was, as became apparent as reviews began to appear from anthropologists close to the field. Writing in *New Republic*, George Washington University anthropologist Colin Turnbull pointed out that, for Mead's study of female adolescence her choice of quarters removed from a Samoan home was sound, offering her more privacy and more freedom of movement than she would have had as a female in a Samoan home. New York University head of anthropology Annette Weiner adds that an honorary "chief" would be as limited in his access to the more domestic aspects of Samoan life as Mead was to the more male-dominated governmental aspects. Separated in space, time, and gender, they saw different parts of Samoa. Furthermore, noted Ward Goodenough of University of Hawaii at Manoa in a letter to *Science*, Mead's field research has little to do with her current reputation in anthropology. Her major contributions have been in questioning both lay and professional assumptions about human behavior. "That her own empirical research in connection with these questions was of questionable quality and that at times she overstated her case are minor matters compared with the role she played in raising these questions and stimulating others to examine them." (5/27/83, p. 906)

As for Freeman's book being a "scholarly refutation," Weiner notes that in Freeman's field, the scholarly tradition calls for publishing one's own monograph on a culture — something Freeman has not done on Samoa — and letting the community of anthropologists judge its implications; a personal, direct attack on a colleague is virtually unprecedented. The book's documentation, reviewers have found — as they do for all scientific discourse — contains bias, conjecture, distortion, and selective use of data, in this case often from Mead's own honest, often humorous, self-searching memoirs and records. I happened to find one error along these lines. I looked up the passage in Freeman's book that describes her starry-eyed arrival in Samoa, the episode from which *Time* derived its lead, and found reference to one of Mead's published letters. Checking out the letter itself, I found no mention of Stevenson or romantic tales whatsoever, and a tone that was downright laconic at times.

Finally, Freeman's challenge to anthropological theory, reviewers generally agreed, was insignificant. Even if all of his claims about Margaret Mead were correct (and for certain some of them are — her work has been criticized before), his findings offered no theoretical insight. The book is, Rice University anthropology department chair George E. Marcus wrote in *The New York Times Book Review*, "a work of great mischief."

The Freeman/Mead affair is not the first time that the press went for symbols rather than substance in science. Press critics note in coverage of scientific controversies a heavy reliance on official or well-established scientific experts. One study contends, for example, that California reporters missed the story on hazards of asbestos in the state because they were checking only with government sources, not labor leaders and others. According to other studies, when official government sources failed to provide a complete and convincing story about Three Mile Island and about swine flu, reporters became indignant — but not investigative. In other words, at times reporters place inappropriate faith in one source or one kind of source of information, rather than seeking out the full range of views that constitute a scientific controversy.

The person who would have had the stature and articulateness to force a more balanced press coverage of the Freeman-Mead incident was missing, of course — Mead herself. As a result, much of the public has likely been left with the impression that she has been exposed as an incompetent scientist. But she still gets the last word. Her colleague Rhoda Metraux points out that in a 1959 article about Franz Boas, Mead wrote, "The myths that obscure the personality of an intellectual leader gather thickest in the years immediately following his death, when there are many people alive who speak with varyingly authoritative voices, and the next younger generation listens." □

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MILITARY HISTORY OF THE U.S. SPACE SHUTTLE

Continued from pg. 10

ciety budget crunch. In 1966, the UN ratified the *Peaceful Uses of Outer Space Treaty* banning "weapons of mass destruction" in space. Among those who objected to the treaty were General Schriever and Walter Dornberger.¹⁸ Schriever resigned from his command and went to work as a consultant for the aerospace industry. In November of 1966, shortly after his resignation, he told a meeting of the American Institute for Aeronautics and Astronautics that "what I am most unhappy with is the slowness in getting on with the maneuverable reentry spacecraft program."

The Shuttle Coalition Forms

With the Pentagon focusing its advanced research and development on the technologies of jungle warfare, and NASA tied up with completing the Apollo moon landing, future space programs were put on hold. Richard Nixon entered the Presidency and found that neither NASA nor the Pentagon had any clear visions for post-Apollo space activities. Three years later, the industry/military/NASA coalition had formed around the space shuttle. On January 5, 1972, President Nixon formally announced his approval of the shuttle, which he called, "an entirely new transportation system designed to help transform the space frontier of the 70s into familiar territory, easily accessible for human endeavor in the 1980s and 1990s."

The space shuttle's reusability, maneuverability and large carrying capacity would be the key for this hoped-for routinization of spaceflight. The shuttle orbiter would be able to place satellites weighing up to 65,000 pounds into near-earth orbit, and 40,000 lbs into the militarily-useful polar orbits. The Air Force took on the task of developing an upper stage rocket to deliver satellites weighing up to 5,000 lbs. to geostationary orbits, those orbits nearly 25,000 miles above the equator where a satellite remains stationary relative to the surface of the Earth by circling the globe every 24 hours. With the shuttle's capabilities, a spaceship would now be able to rendezvous with an orbiting satellite, and retrieve it from space for repairs. Furthermore, the shuttle would open up the possibility of carrying materials and workers to space station construction sites where huge orbiting platforms could be built: web-like antennae so large that on Earth they would collapse under their own weight, multi-purpose satellite farms combining powerful sensors, data-processors, transponders and transmitters. Even without in-space construction, the ability to launch larger satellites, in greater numbers, from the shuttle promised to change the nature of satellite systems.

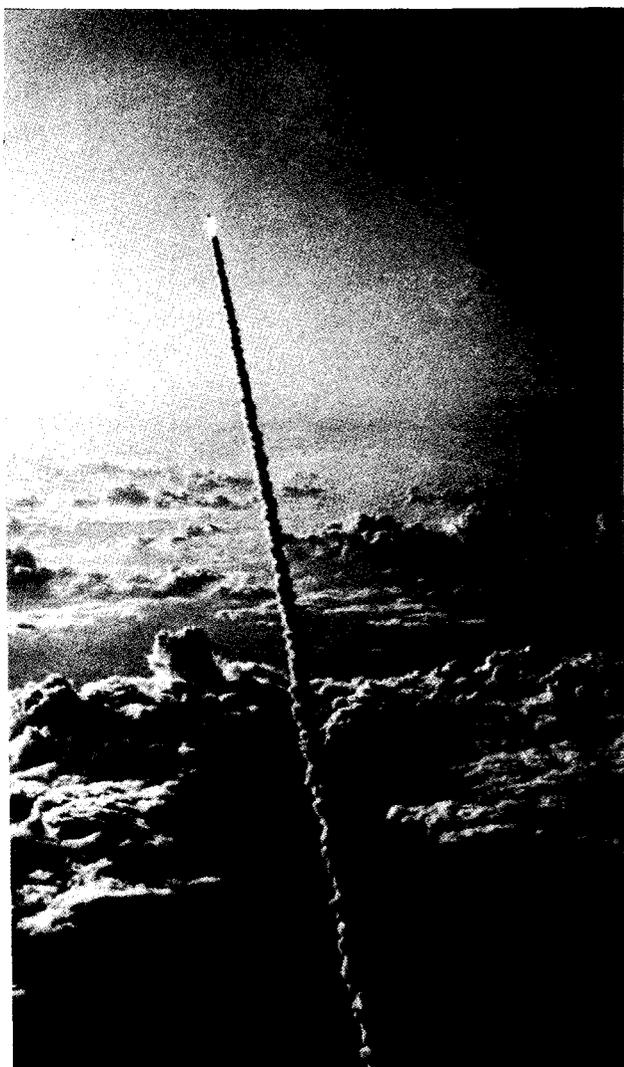
Previously, space systems were kept small and simple as possible, while the ground equipment was large, expensive and complex. If large and complex and powerful satellites were placed in orbit, then the ground equipment could be made small, simple, and capable of being inexpensively mass-produced. The commercial applications of this reversal, known in the space business as complexity inversion, include: widespread access to data carrying transmissions, home reception of satellite TV broadcasts, direct satellite communications via video telephones, and even Dick Tracy-like wrist radios. Other potential applications of the shuttle's promised capabilities included orbiting factories where industrial processes could take advantage of the weightlessness and near-perfect vacuum of space, solar power satellites transmitting energy to Earth via microwave, orbiting mirrors for nighttime illumination of selected parts of the Earth, resource and pollution monitoring, and global scientific research.

The Cover of Commercial Applications

It was the potential commercial applications of space technology to which the shuttle's promoters pointed. The more futuristic proposals had the potential to stir the popular imagination in the way that the exploration of outer space once had. Just as "peaceful space exploration" had been the motivating theme behind the first era of space activity, space commercialization, industrialization and, for the more adventurous, colonization would become the motivating themes for the shuttle era. But just as NASA's space programs of the 1960s had served as a cover for the military development and improvement of rockets, satellites, and the means to deliver nuclear warheads, so too, space industrialization and commercialization would serve as a cover for the exploitation of the military implications of complexity inversion, and improved satellite communications. The first use of remote sensing devices, computerized command and control and automated warfare was already underway in the jungles of Viet Nam and Laos. The extrapolation of that experience into a worldwide system that could eventually control a global electronic battlefield awaited the space technology developments of the coming era.

In 1969, General Westmoreland, commander of US forces in Southeast Asia, at a meeting of the Association of the US Army shared a vision of future wars based on his experiences with electronic warfare:

I see battlefields or combat areas that are under 24 hour real or near real-time surveillance of all types. I see battlefields on which we can destroy anything we locate through instant communications and almost instantaneous application of highly lethal firepower. In summary, I see an Army built around an integrated area control system that exploits the advanced technology of communication sensors, fire detection, and the required automatic data processing.



“The economic and political reality is that success of the shuttle literally depends on its utilization by the military.”

How such a vision might be made global in scale was explained by General Schreiver in an interview in 1983. Schreiver was being interviewed by this writer in conjunction with the General's role as advisor to President Reagan, and author of the Reagan administration's transition report on Space:

What I want is a radar surveillance system which allows you to spot everything that's moving, either on the surface, or above the surface of the Earth. And if we had a number of companion systems, a high energy laser, or particle beam weapon, or something else, along with the pointing and tracking ability to knock down airplanes and missiles, then you wouldn't even need to knock out cities, you could knock out forces. You could pin your enemy down on Earth. What would they do?

From positions high above the Earth, or in well-protected command centers far from the field of action, the allure of invulnerability is obviously attractive. The Defense Advanced Research Projects Agency plans to launch from the Shuttle in 1988 what is known as the Advanced Sensor Demonstration, which will go into geostationary orbit and, using a variety of sensors, track airplanes as well as missiles.

A wide variety of satellite improvements are under development: improvements in camera optics for spy satellites, high speed integrated circuits to attain “real-time” command and control over distances of thousands of miles, and in-orbit data relay stations to eliminate the need for politically vulnerable overseas ground stations. As U.S. military strategy becomes ever more dependent on space systems, more attention must be paid to protecting satellites and destroying Russian satellites with space weapons. Thus the next stage in the militarization of space becomes an arms race in space, complete with actual satellite battlestations. In addition, as satellites become more crucial to nuclear warmaking, new satellites are required that can withstand the effects of nuclear explosions in space.

As long as nuclear strategists assumed that satellites would only be required to participate in the launching of a one-time massive retaliatory strike in response to a Soviet attack then “survivability” beyond the first nuclear exchange was not considered crucial. But with nuclear war strategists now planning protracted wars, involving possible waves of strikes over a period of time, nuclear survivability has become a priority goal for attainment by the next generation of communications satellites to be launched by the shuttle.

There are three main features necessary to ensure survivability of military satellites: 1. electronic components shielded from the electromagnetic effects of the explosions; 2. the capacity to function independently of ground control for the period when ground/space communications are blacked out; and 3. internal power sources, using nuclear fuels, rather than vulnerable solar cells. Each of these requirements increases weight, complexity, and costs.

Like any new technology, the cost effectiveness of the shuttle is dependent on the amount it is used. As the number of shuttle launches increases, the cost per individual launch decreases. The only way the shuttle will become cost competitive with expendable launch vehicles is for one of the fleet of four shuttle orbiters to be in use on the order of once per week. In the foreseeable future, in this period of economic stagnation, only the U.S. military will be likely to have access to the political and economic clout required to finance shuttle use to anything close to that extent. Supporters of the shuttle and an expanded near-earth space program are an odd coalition of futurist industrialists who look to the infinite resources of space as the answer to limits to growth, science fiction fans, like those that flooded President

Ford with telegrams urging the renaming of the first shuttle orbiter to the USS Enterprise in honor of Star Trek, space colonists obsessed with the feeling of being trapped on this planet, and even certain peace activists who envision a global satellite watch system to guarantee peace and lay the foundations for world government. The economic and political reality is that success of the shuttle literally *depends* on its utilization by the military. As military systems are designed to take advantage of the space shuttle's capabilities, the systems then become dependent on the shuttle. A feedback dynamic is established leading inexorably to the increasing militarization of space. General Schriever made note of this dynamic back in 1967 when he was pursuing the shuttle. He lamented to the Aviation and Space Writer's Association that "we can't actually justify the high costs of developing a reusable system until we have the necessary volume of space missions, at the same time we can't cost-effectively program any high utilization of space vehicles until the price comes down."

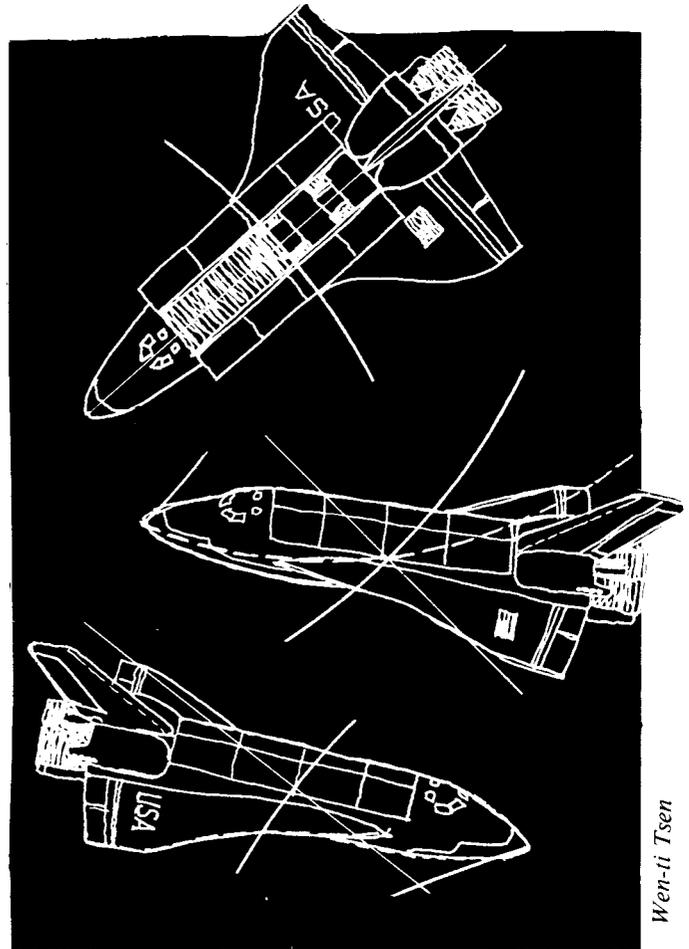
Michel Michaud, a leading theorist and propagandist for the future of Space industrialization, acknowledged that the military,

not only spends more on R&D than any other institution in America—it is also freer to work in riskier projects whose cost benefits may be uncertain. . . . It was R&D for military aircraft that made possible the jet airlines we know today. . . . It may be that only military requirements will allow us to breach the cost barrier and to take space policy out of the hands of the Office of Management and Budget.

This is the unhealthy situation in an economy in which the military is the only sector capable of high-risk, planned investment. This feedback between high-tech R&D and weapons production, crucial to the political economy of weapons production, must be confronted by peace activists. Protesting the militarization of space while still clinging to fantasies of space colonies, mass space flight, and space industry is an inevitably self-defeating contradiction. The recent talk of space commercialization, industrialization and the routinization of spaceflight, no matter how well intentioned, will end up serving the military space program in the same capacity as the original NASA: a Trojan Horse concealing increasing militarization of Space. □

REFERENCES

1. Report of the Presidential Science Advisory Committee, *The Space Program in the Post-Apollo Period*, 1967.
2. Platform of the Republican Party Convention, 1968.
3. *National Goals of the Post-Apollo Period*, Hearings before the Committee on Aeronautical and Space Science, U.S. Senate, 89th Congress, August 23-25, 1965.
4. *New York Times*, June 26, 1975.
5. *Saturday Evening Post*, October, 1961.
6. *Time*, November 30, 1966.



Wen-ti Tsen

"To the Air Force, the shuttle represented a crucial step toward the "manned" military space presence the Air force had been craving for years."

7. See the account in John Logsdon's, *The Decision to Go to the Moon*, Chicago, 1970.
8. Staff Report of the Select Committee on Astronautics and Space Exploration, *The Next Ten Years in Space*, House of Representatives, June, 1959.
9. *US News and World Report*, October 9, 1981.
10. *Ibid.*
11. Reprinted in *Aviation Week and Space Technology (AW&ST)*, September 18, 1961.
12. Jack Manno, "The Risks of Warfare in Space," *The Nation*, November 13, 1982.
13. See Lyndon Johnson's *The Vantage Point* and Kennan and Harvey's *Mission to the Moon*, New York, 1969.
14. *AW&ST*, November, 1961.
15. *Fortune*, June, 1962.
16. *AW&ST*, June 26, 1975. See also *The Rocket Team*, Ordway and Sharpe, New York, 1979.
17. *AW&ST*, Sept. 18, 1961.
18. *New York Times*, November 30, 1966.
19. House Committee on Science and Technology, hearings, *Future Space Programs*, June 24-26, 1978.
20. *Ibid.*

book review

by Sarah Schulman

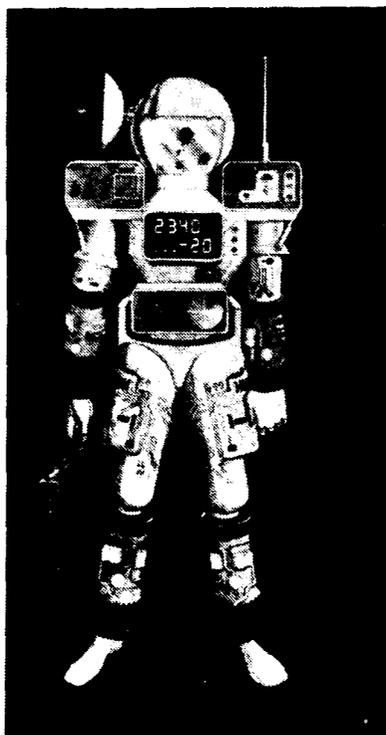
The Technological Woman: Interfacing With Tomorrow Edited by Jan Zimmerman, Praeger, NY 1983

Intrinsic to America's cultural mythology is the belief that technology is a symbol of an objective and desirable progression. Jan Zimmerman's new book, *The Technological Woman*, challenges this assumption. Instead, Zimmerman proposes that, "technology reflects the values, thoughts, ideologies, beliefs and biases of its creators." This anthology proposes to tell us who the new technocrats are and what they have in store for women. Although they are somewhat scattered, the collection contains many interesting tidbits of information ranging from Autumn Stanley's overview of Black women inventors to Francis GABe's [sic] self-cleaning house. Most articles, however, pertain to the impact of high technology on women as producers, operators and consumers.

Because the electronics industry has been on the forefront of transferring production to low-wage areas of the world, Maria Patricia Fernandez Kelley describes Third World women as the international labor force for the manufacturing of technology. "Because of their behavior, expectations and attitudes (which are the results of socialization) . . . and because of their subordinate positions in their own households, these women constitute a highly vulnerable, docile and manipulatable workforce . . . (offering) distinct advantages from industry's point of view."

Once the word processors and home microcomputers are assembled, U.S. women's workplaces are permanently altered. Barbara A. Gutek's article asserts that since most working women work in offices, the technological invasion will affect the structure of women's work lives but not their status. Currently office labor is gender stratified, with men in better paid, supervisory jobs. Women earn less, remain subordinate and have little possibility of promotion. "In the office of the future this polarization could increase . . . because of decisions made by upper level management who are overwhelmingly male . . . creating an

underclass of female workers." Margaret Lowe Benston argues that automation of office work will increase the bosses' ability to electronically survey workers. They will be able to monitor productivity by recording every key stroke. Furthermore, as jobs become more fractionized and a woman's judgement is eliminated from the working process, the office becomes a clerical factory until automation finally replaces most jobs.



CPF

As consumers, women are constantly being encouraged to purchase home technology devices. Christine E. Bose and Phillip L. Bereano remind us that despite the notion of "labor saving devices," technology has not significantly affected the status of housework, who does it, or how much time it takes to do. "Housework, like other alienating work, is basically menial; mechanization of tasks does not change this. It only means the worker must now tend ma-

chines, while remaining socially isolated." So why do people buy expensive appliances that don't improve their quality of life? For one thing, Americans ignore their own experience and actually *believe* that appliances save time. Second "appliances have symbolic value" which takes precedence over efficiency.

While this book contains a wide range of opinions, there are some that are offensively reductionist. Ann Markusen claims that gay men congregate in cities because "without leaning on women . . . to do work for you" one must live in a high-density area to "get your clothes cleaned." Not only does this assume that most gay men are wealthy and live in cities, but it ignores the status of married men whose housework is done for free. Gay men probably take better care of themselves than Markusen thinks.

Many contributors to this volume claim that the solution to women's adversarial relationship with technology is to climb higher on the corporate ladder. Some attempt to show how technology improves women's lives and some describe it as regression. What is ultimately unsatisfying about this collection is that none of the contributors sees far enough to effectively challenge the concept of "progress." Over time new problems are created and new solutions are proposed, creating an illusion of forward motion, but, in reality, the material and emotional quality of most people's lives does not improve. In short, the problem with *The Technological Woman* is that she can't see past her video display terminal to the social context in which she operates. If we want to critique high technology as a mode of social and economic control, we have to question not only the changing home and workplace, but the other factors that repress our ability to imagine a different life for ourselves. □

Sarah Schulman is a writer and feminist activist currently working for WomanNews in New York.

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Critical Mass '83 Conference Workbook, includes papers on the military budget, decentralization, proliferation, the power/weapons links, citizen action, and more. Included as part of two packages available for \$15 and \$20 respectively from: Conference Materials, Critical Mass Energy Project, Box 1538, Washington, DC 20013.

Occupational Health Resources, pamphlets, books, fact sheets, audio visual materials. Available from: Western Institute for Occupational and Environmental Sciences, Inc., 2520 Milvia St., Berkeley, CA 94704.

CORRECTIONS

In the July/August 1983, Vol. 15, No. 4 *Sf/P*, we inadvertently failed to attribute credit in two instances. The box on pg. 8 was written by Frank Bove. The photograph on pg. 25 was courtesy Les Vants Photo Service.

Also, the byline of the "Dioxin and Dow Chemical" article should read "Carole Ann Barth," not "Carol Ann Barth."

"For Export Only: Pesticides and Pills", a 56 min. film on the export of such restricted pesticides as DDT, Dieldrin, Aldrin, and 2,4,5-T (a major ingredient of Agent Orange) from the developed to the Third World. Available from Icarus Films, 200 Park Ave. South, Suite 1319, New York, NY 10013 (212) 674-3375.

"Nuclear Power: War and Profit", a 22 min. anti-nuclear documentary film "on the realities of the nuclear nightmare in the United States, its continuing everpresent hazards, its connection to our military, and the international arms race." Available from: Parallel Films, 314 West 91 St., New York, NY 10024.

"In the Nuclear Shadow: What can the Children Tell Us?", a 25 min. film depicting 27 children and their thoughts and feelings about the arms race. Available from: Educational Film & Video Project, 1725 B Seabright Ave., Santa Cruz, CA 95062 (408)427-2627.

"Paul Jacobs and the Nuclear Gang", a 60 min. color documentary film on "the U.S. government's attempts to suppress information about the health hazards of radiation." Contact: Penny Bernstein, New Time Films Inc., 74 Varick St., Mezzanine B, New York, NY 10013 (212) 226-8097.

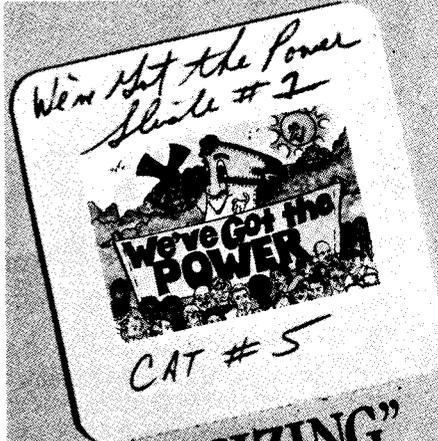
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Monitor, bi-monthly newsletter of the Labor Occupational Health Program, \$10/year, checks payable to The Regents of U.C. Available from: LOHP, 2521 Channing Way, Berkeley, CA 94720. Films, slideshows, books, pamphlets, catalog available.

AIDS conference, November 14-17, 1983, Roosevelt Hotel, New York Academy of Sciences. For more information contact: Conference Director, The New York Academy of Sciences, 2 East 63rd St., New York, NY 10021.

Arming the Heavens: The Hidden Military Agenda for Space, 1945-1995, Jack Manno. (New York: Dodd, Mead & Co.) An "analysis of the ideologies and myths that lie behind the military space program in its proper historical context and to explain the many political and military issues surrounding the early space program." New York: Dodd, Mead & Co., 1983, \$12.95.

Loaded Questions: Women in the Military, W. Chapkis, ed., addresses such issues as "Do equal rights include the right to fight? Could feminists reform the military from within? Are women naturally pacifists?" and provides perspectives from around the world. 97 pp., \$4.95, Institute for Policy Studies, 1901 Q. St., NW, Washington, DC 20009.



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