SCIENCE FOR THE PEOPLE

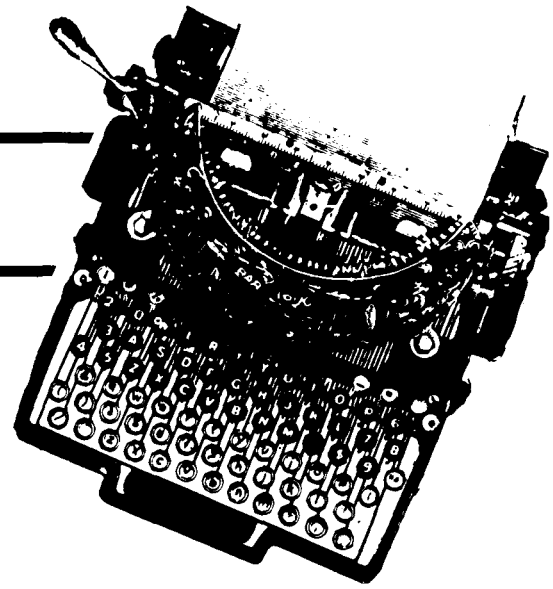
Vol. 16 No.6 $2.50

SETTING OUR PRIORITIES

Limits to Science
Nuclear Secrecy
Farm Labor Movement

Technology and Freedom
Worker-Scientist Cooperation

letters



Upcoming Changes

Dear SftP readers:

As we bring Vol. 17 to a close with this issue, we at SftP already have many exciting plans for the magazine next year, including some of the most powerful special issues yet, and a new look for the magazine.

The upcoming two special issues on computers and genetic engineering respectively will be longer and more comprehensive than ever before, thanks in part to some grant money from a private foundation that supports our work, and in part to an expanded staff. The magazine's new face will begin with the next issue, an attempt to keep us looking fresh and to make the magazine more readable and appealing. We hope you'll be with us and will let us know what you think!

—The Staff

Prediction Propaganda

Dear SftP:

The article, "Statistical Propaganda and the Nuclear Arms Race," in the July/August issue of *Science for the People* is a welcome and useful contribution to efforts to clear away the smoke blown out whenever the United States' role in the arms race is discussed.

Unfortunately, the article is weakened by the section about predictions, which is not explicit enough about what is wrong with predictions in propaganda. This is especially unfortunate because *Science for the People* people should be well versed on the role of prediction (conjecture, hypothesis etc.) as the driving force in the (dialectical) development of factual observation and theoretical explanation.

Of course, the predictions made by the U.S. Military are used to manipulate public opinion and threaten opponents of militarism and have no scientific purpose. Moreover, the methods used in making these predictions have more in common with fortune telling than science, as the author recognizes with the heading, "Statistical Palm Reading." But it proves no case merely to claim, as the author does, that (some of) these predictions are wrong.

The arms enthusiast predicting that "the U.S. will fall behind" if we don't increase military spending will respond to facts about arms ratios at any given time by saying, "We increased our spending and we didn't fall behind. That proves the prediction was right."

JOKE:

"The best way to get rid of elephants is to keep an umbrella open all the time."

"But I never saw any elephants around here!"

"See, it works perfectly."

Prediction in political discussion and policy making will most likely never have the same kind of foundation as does prediction in science. But to become a respected democratic institution, political prediction should meet the minimal standard of honesty in conveying to the public a grasp of the conditions in which a prediction is expected to be applied.

Sandy Orlow
Rockville, MD

Workplace Risks

Dear *SftP:*

The Nelkin and Brown article ("Knowing about workplace risks") in the January/February issue (*SftP* Vol. 16, No. 1) is perceptive and informative. I would certainly agree that the Reagan administration's heavily deregulatory approach has shifted major responsibility to workers for workplace safety.

I believe it is important to emphasize that chemical hazards emanating from the workplace present possible health hazards to workers as well as community residents. An estimated 1,000 new chemicals are marketed each year. Annual hazardous wastes produced in the United States are estimated at between 150 and 275 million metric tons. Not surprisingly, many people are exposed to chemical hazards. An estimated 40 to 50 million people may have been exposed to chemical hazards regulated by the Department of Labor's Occupational Safety and Health Administration. An unknown number of persons, both within and outside the workplace, have suffered health harms associated with exposure to chemical hazards originating from worksites.

Several local and state "right to know" laws specifically recognize the health dangers to workers as well as community residents arising from chemical toxins and wastes produced in the workplace. New Jersey, Pennsylvania, New York, Ohio and Massachusetts are among the states which have enacted, or are actively considering, either state or local executive or legislative measures intended to protect community residents and workers from workplace-related chemical hazards.

The federal "right to know" standard, promulgated in November, 1983, unfortunately attempts to dilute the protections offered by many of the extant, or proposed, state and local right to know measures. A coalition of groups, including the Public Citizen Health Research Group, is currently challenging the federal standard in federal court.

Because we live in an increasingly chemically-polluted society, it is of obvious paramount public health importance to disclose knowledge about workplace chemical hazards to affected workers and community members. The public health and scientific community must become closely involved with evolving legislation in the right to know area. Workers, and their unions, must indeed assume major responsibility with respect to overseeing the compliance of employers with pertinent right to know regulations. It is also vitally important to bring lawsuits in appropriate instances.

L. Uzych
Wallingford, PA

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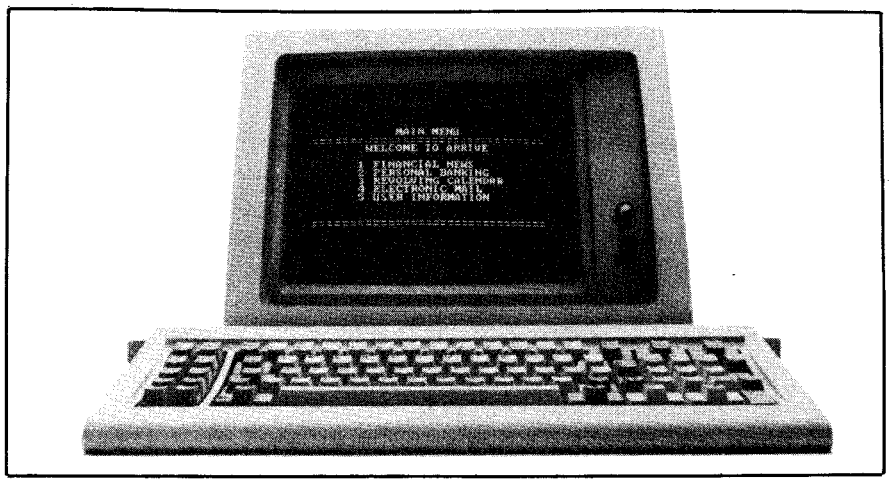
news notes

by Seth Shulman

VDT Update: Focus on Microwave Radiation

While the news is far from definitive, evidence linking hazardous biological effects with the low level radiation emitted by Video Display Terminals (VDTs) seems to be mounting. While many people have been apprehensive about radiation hazards (see, for example, SftP Vol. 15 No. 1), government and industry experts have steadfastly maintained that the emission levels are too low to be harmful.



Last year, however, Dr. Jose Delgado and associates at the Centro Ramon y Cajal Hospital in Madrid, Spain demonstrated disturbing evidence that pulsed magnetic fields could alter the development of chick embryos at extremely low levels (similar to those emitted by VDTs). Delgado postulated that *pulse shape*, not the level itself may be the "decisive parameter" in determining biological effects.

Many investigators have been and remain skeptical of Delgado's results, claiming that they are not reproducible. However, researchers in Sweden have partially replicated Delgado's findings, prompting new government research, according to *Microwave News*.

Research in this area is now focused on something called the VDT flyback transformer which controls the electron beam's movement across the inside face of the display screen. According to recent measurements, the flyback transformer emits very low frequency (VLF) radiation roughly similar to that used in Delgado's experiments.

The FDA is due to issue a revised policy statement on VDTs soon, although insiders say that it is unlikely that it will be significantly changed. Some experts, such as Richard Tell, a physicist with the EPA, have joined in the call for more research in this area. Tell stated that the similarities in shape and intensity between VDT pulses and those used by Delgado should be studied closely. Tell's own research comparing the magnetic fields led him to state that the possibility of bioeffects cannot be ruled out.

With the number of VDTs worldwide reaching truly astronomical proportions, the importance of resolving any potential health hazards seems clear to us at SftP; we join others calling for this as a research priority. Unfortunately, some of the current research may never reach the public. While IBM has undertaken a study in this exact area, they do not plan to release the final report.

Send Us a Note

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Toxic Waste Dumps for the People

In one of the more interesting pieces of news to come our way lately, the state of Florida has become the first to introduce state-wide, mobile hazardous waste collection facilities.

State officials were concerned by the widespread failure of citizens to bring hazardous household products like garden pesticides and paint thinners to the appropriate disposal facilities. Commonly such products, including everything from wood preservatives to nail polish remover, would wind up at the local dump, or down the drain. To combat the potential danger of underground aquifer contamination, officials decided to try, in the words of *Engineering News*, to "bring hazardous waste dumps to the people."

The "mobile facilities," actually vans staffed by chemists, have already picked up more than *100 tons* of hazardous waste products, more than half of which have come from homeowners. Florida, a state which relies almost exclusively on groundwater for drinking water supplies, has seen increasing concern about aquifer contamination on the part of state officials, concern which has often led to prompt to prompt and progressive action. For example, Florida officials were the first to ban the pesticide Temik which has caused aquifer contamination across the country. (For more info, see SftP Vol. 15 No. 2.)

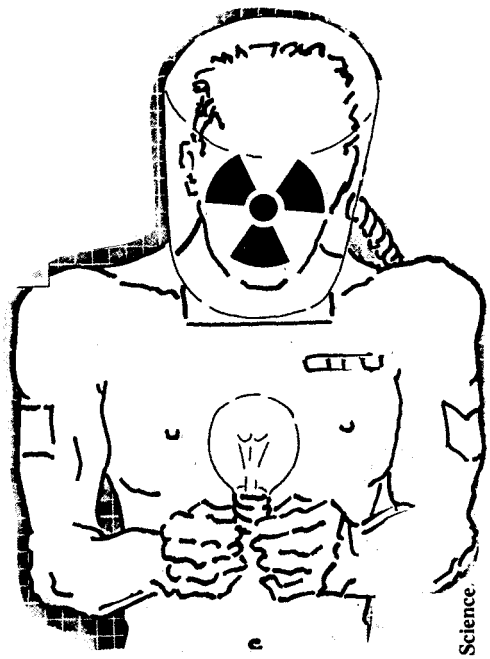
According to Frank Walper, the project administrator, more than twenty states have phoned expressing interest in the project. Some, such as Massachusetts, have had limited community-based programs of a similar nature, but none have undertaken the project on a statewide basis. Hopefully, we will now see more states following Florida's lead.

Higher Cancer Rates Found by DOE for Nuclear Workers

Ever since 1977, when Dr. Thomas Mancuso of the University of Pittsburgh and his colleagues published the findings of their 13-year, government-sponsored study indicating that workers at the Hanford, Washington nuclear facility faced risks of radiation-induced cancer 10-30 times greater than the radiation limits assume, the Department of Energy (DOE) has had only DOE scientists conduct all subsequent health studies. Yet as the years go by and we become more entrenched in the "nuclear age," the evidence of radiation-induced cancer mounts accordingly.

Now, reports of unpublished DOE documents in the October 15th issue of *New Scientist,* reveal that ongoing DOE studies have, in fact, found that cancer rates are significantly higher than average at U.S. nuclear facilities.

The new evidence is contained in internal documents summarizing 21 investigations of DOE nuclear facilities by DOE-affiliated Oak Ridge Associated Universities, and seven studies by Los Alamos National Laboratory and Battelle Northwest Laboratory, (also DOE facilities). Excess cancers among nuclear workers have been found in three-quarters of the 12 studies that have yet yielded results, including all four of the DOE plants studied.



Radical Science

Among the findings quoted from *New Scientist* are the following:

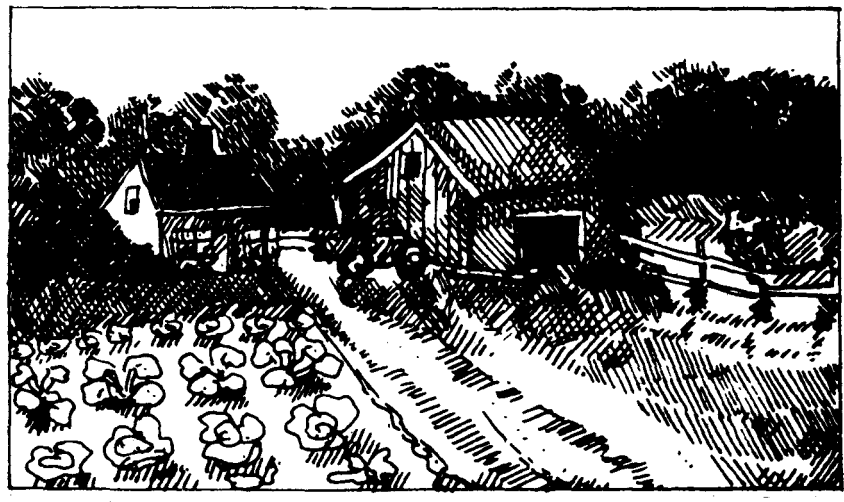
"• Workers at the Oak Ridge National Laboratory have a 49% excess leukemia mortality compared to the general public . . . (also demonstrating) a gradient with increasing radiation dose.

• Janitors, laborers, maintenance and construction workers at the laboratory have a 'signifficant excess risk' of radiation-associated cancers.

• Workers at Oak Ridge's Y-12 Tennessee Eastman uranium processing plant between 1943 and 1947 had 'signifficant excesses of deaths from lung cancer when compared to U.S. white male rates.'

• Workers at Oak Ridge's Y-12 Union Carbide weapons plant have 'excess death for cancer of lung, brain and central nervous system, Hodgkin's disease, and other lymphatic tissue.'

New Interest in Organic Farming, But Not at the Dept. of Agriculture



Workbook

American farmers will spend an unprecedented $12 billion on fertilizer and pesticides this year. With such astronomical costs, it is easy to understand why farmers in increasing numbers might look to alternative, organic farming methods.

Aside from the obvious environmental benefits to be gained from eliminating dependence on pesticides, many studies in recent years have indicated that such techniques are economically sound as well. Rodale Research Center in Pennsylvania, for example, recently published a five-year study of a commercial farm that used organic techniques. In addition to realizing yields equal to or better than state and county averages, and a below-average soil loss through erosion, the farm studied had operating costs roughly 10% lower than comparable chemical-based farms in the area. According to the *Washington Post,* lately such studies are even finding their way into the pages of the trade literature.

Organic farming has received hardly as warm a reception at the Department of Agriculture (USDA), however. Many Reagan appointees have received more publicity, but Agriculture Secretary John R. Block has been making serious, albeit less-noticed, decisions in this field with ominous implications for us all. One such decision is Block's adamant opposition to efforts by Congress to require the USDA to take a closer look at organic farming methods. Block even went so far as to fire the department's only full-time specialist assigned to coordinating information on organic agriculture.

Now a bill faces Congress that would authorize a five-year $10.5 million study of organic farming techniques. James Weaver, congressmember from Oregon and sponsor of the bill, has candidly explained what he calls USDA "intransigence" on this issue: "The opposition comes from entrenched interests who believe in and profit from existing modes of agriculture." We couldn't have said it better.

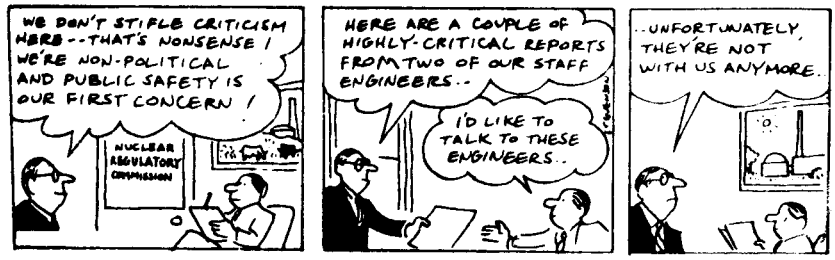
• Workers at Oak Ridge's gaseous diffusion plant exhibit 'excess deaths due to lung and brain cancers and respiratory disease.'

• Workers at the DOE's Fernald, Ohio uranium-processing plant, have a 36% excess of digestive cancers. Also, 'there is an association between exposure to uranium and the development of non-malignant respiratory disease events.'"

The news is dire for the thousands of workers at nuclear facilities across the country and around the world. But, hopefully, publication of the mounting evidence will cause increasing pressure for more stringent safeguards. Already there is a bill before Congress to have epidemiological studies of the effects of radiation transferred from the control of the DOE. Even that will be a hard fight.

Charles Eddington, associate director of the DOE's office of health and environmental research claims that his office is "totally independent of the weapon's program," and should be entitled to keep control of the almost $60 million a year spent on research on health and environmental effects of radiation.

In a related story, a 1976 DuPont study which was suppressed for seven years, came to light last year when the Congressional Armed Services Committee learned of its existence. Even then, the week before DuPont officials handed it over, they had researchers "re-analyze" the data to explain away the findings. The original findings included a 60% excess of lung cancer and 114% excess of leukemia among employees at DOE's Savannah River Plant (operated by DuPont) as compared to DuPont's workforce as a whole.



Since the DuPont study's release, an independent panel of epidemiologists convened by the government's Centers for Disease Control in Atlanta has unanimously condemned the last-minute "switch of statistical analysis." Similarly, the group recommended that the data be reviewed by scientists unconnected to the DOE or DuPont.

Both these cases point to the need for third-party studies. Allowing the DOE with their Congressional mandate to "conduct research in support of energy-development technology and the nuclear weapons program" to conduct the major government-funded research on health effects of radiation makes about as much sense as having the Pentagon undertake the definitive study of the viability of disarmament. More importantly, however, these cases point also to the need for corporate and governmental bodies to deal with these issues more seriously. That, it seems, won't happen until such parties will face up to the existing research findings.

Already DOE officials are denying that there is any evidence in the internal studies which links the excess cancers to radiation exposure, directly contradicting the evidence which finds a gradient with increasing radiation dose. Until such evidence is met head on, hope for more stringent controls, or even any improvement over the current situation seems slim.

Newer Doesn't Mean Better

By now many of us have seen the barrage of advertisements for the latest aspirin substitute, ibuprofen, appearing on the market with names like *Nuprin, Advil, Motrin,* and *Rufen.* This pain reliever (formerly a prescription drug) was approved for over-the-counter sale this summer by the FDA. Aside from the questionable need for yet another mass-marketed pain reliever, the drug is raising the ire of even some of the members of the FDA committee that okayed it.

According to *Science News*, kidney experts warn that the drug could hurt people with impaired kidney functions, diabetes, or even hypertension. Says Leslie Dornfeld, member of the FDA committee that okayed ibuprofen for over-the-counter sale, "If people with such conditions as diabetes and hypertension 'pop two every couple of hours,' they could go into acute renal failure." Dornfeld stated that he is particularly upset because his personal approval for the drug came only after he was convinced the package insert would contain adequate warning. But he says, "I don't thing it's coming across clearly."

A Case Study from the Netherlands

WORKER-SCIENTIST COOPERATION

Peter Groenewegen and Paul Swuste, both natives of Holland, are scientists who have been involved in the project they describe in this article; Peter Groenewegen from the University of Amsterdam, and Paul Swuste from Delft.

by Peter Groenewegen and Paul Swuste

In occupational medicine and in social-science research related to health and safety in the workplace, there has been much attention focused on factors like stress, physical injuries, and work satisfaction. However, until quite recently, scant attention has been paid to long-term work-related diseases like cancer, which can be caused by chemicals. One reason for this is the difficulty workers and their organizations have in focusing politically on such problems. Their primary interests tend to be geared more towards the needs of the day-to-day trade-union policy. Furthermore, actions on occupational safety and health issues are difficult to sustain in light of the heavy reliance on scientific evidence and expert support. As a consequence many of these issues end up in debates by "experts" in which there is little room for worker involvement.

Who are the Victims?

There are a number of problem areas in occupational safety and health. Most of them originated from the changes in industrial productivity associated with the industrial and the subsequent scientific-technological revolution. Especially significant are the increasing number of synthetic chemicals. This problem is so immense largely because the intermingling of hundreds of chemicals in the workplace produces a variety of different—and unknown—effects on the health of the workers involved. Indeed, it is difficult to pinpoint and blame any specific chemical for a health problem because another, of which even less is known, may easily have caused the problem instead.

Work-related diseases caused by chemicals are more complex and complicated than traditional work injuries and require novel and preventive strategies. Their development is typically caused by prolonged low-level exposures to chemicals and the effects are often cumulative and irreversible. Their progression affects

sensory perception, respiration, specific organs, and the central nervous system. In particular, cancers caused by chemicals often develop long after exposure, perhaps 25 to 40 years after initial contact.

The recognized carcinogens tend to be those which very substantially increase the relative risk of some particular type of cancer. There may exist important occupational carcinogens not yet identified because the added risk is small compared to that due to other causes or because the group exposed is small. Other reasons might be that the hazard has not been suspected and so not looked for and that, due to the development time for human cancers, chemicals introduced in the last twenty years might not be showing their effects yet.

Occupational cancer is concentrated in a small section of the population. The risk of developing these diseases may, in one specific factory or production process, be quite large. This results in a burden that falls most heavily on the lower socioeconomic groups. Industrial workers are suffering from work-related impairments at a rate 10 times higher than that recorded for professionals in the tertiary sector. Clearly, workers' organizations should improve their strategies to realize improvements in working conditions and to eliminate cancer-causing substances. This is, however, more easily said than done. Workers face the problem of detecting the links between chemicals and specific diseases. They receive little help from the state and industry, who focus attention away from the workplace and on regulatory activities. These activities, when performed adequately, have an effect in the long run and provide some assistance in workplace policies. However, a more useful strategy for workers would be to do research in their own workplace situations, providing information coupled to specific production processes.

We will focus here on the Dutch occupational health and safety situation, discussing one group of workers' attempts to discover, with the cooperation and assistance of scientists and health professionals, the nature and extent of the health hazards at their workplace.

Occupational Safety and Health and Trade Unions in the Netherlands

Safety and health regulation in the Netherlands has been revised recently. The former safety and labor laws are integrated into a Labor and Occupational Hygiene Law passed in 1980, which provides the cadre for a new approach to occupational safety and health. Although at present the bulk of the rules and regulations is derived from former laws, more detailed legislation is expected to be phased in over the next eight years.

The approach to occupational safety and health in the Netherlands is comparable to legislation previously introduced in countries like England and the U.S., giving more room for worker influence. For example, provisions in the law increase the staff representation in the factory inspectorate. (In the Dutch situation companies with a work force of over 100 workers are obliged

WORKER-SCIENTIST COOPERATION IN THE U.S.

In the United States, worker-scientist cooperation and labor-initiated research in occupational safety and health has lagged behind the European experience. With less than 20 percent of the workforce unionized, projects similar to that at the Dutch Cyanamid plant have succeeded through the combined efforts of shopfloor, community, union and government activities.

With the passage of the Occupational Safety and Health Act (OSHA) in 1970, federal funds became available to unions, community and educational programs through OSHA's New Directions grants. New Directions helped fund Coalitions on Occupational Safety and Health (COSH) groups and nonprofit research and training programs. With New Directions money, technical and health workers established occupational health clinics, and developed training and resource materials for concerned workers, union shop stewards and health and safety committees. Through such programs, workers have received assistance in conducting health surveys, investigating health problems, and analyzing hazards and conditions in their workplaces.

When Reagan appointed Thorne Auchter as OSHA's director, New Directions funds nearly dried up. Unions, clinics, educational programs and COSH groups lost most or all of their government funding — Auchter cut back New Directions more than two-thirds his first year in office - and technical assistance to workers suffered dramatically. With the loss of federal funding and the dismembering of OSHA under Reagan ("I question seriously the need for OSHA," Reagan told *Business Week* in his 1980 campaign), worker-oriented health and safety programs have turned to unions, member donations and local government for support.

In Connecticut, when the New Directions program lost its federal funding, occupational health specialists lobbied for state funding through workers' compensation. According to Jane Fleishman, a health and safety educator whose job moved from New Directions to the Division of Worker Education of the Workers' Compensation Commission for the state of Connecticut, "Under a 1983 statute, two-tenths of one percent of all workers' compensation premiums now go to a special fund to train workers in three areas: workers' compensation, occupational safety and health and right-to-know standards." This pioneering program has an annual budget of $350,000 — paid through industry and insurance premiums — and is one of the few public occupational health projects that is both worker-oriented and expanding.

Many community-based and local-level occupational health groups also assist workers with health and safety problems. In Washington, D.C., the Workers' Institute for Safety and Health (WISH), an organization that assists unions and workers with health and safety prob-

to install a factory safety committee in which workers are represented.) The role of the factory inspectorate in the future will be based more on advice than on control. Thus, enforcement will result more from worker-employer negotiation than from the independent actions of the factory inspectorate. The new law also defines the concept of worker well-being which might provide, in addition to strict occupational safety and health guidelines, a new level for realizing worker demands. At the moment, it is not yet clear what the effects of this new law will be. Cuts in the planned budget of the factory inspectorate have already been made, although the time period for the introduction of the legislation is still a matter of debate.

The regulation of chemicals in the workplace is the responsibility of an official government committee, the Maximum Acceptable Concentrations (MAC) committee. This committee is a joint committee of the state, workers' representatives, and representatives of the employers. It relies heavily on research done in other countries but makes its own assessment for each chemical. At this point safety and health research is not organized within one institute. However, there are discussions in progress about the funding of one central institute to focus on occupational safety and health. The responsibility for the research in the institute would lie with all three parties involved.

All unions do not favor a single research institute. Some of them want a central institute to provide basic functions like occupational safety and health documentation and registration of occupational diseases, and a separate research institute under their own jurisdiction.

Trade Unions and Safety and Health

In Dutch trade unions little attention is paid to work-related problems such as occupational safety and health, piece rates, and the like. The structure of the unions emphasizes the trade-union ability to negotiate collective labor agreements at the national level of each economic sector like metalworking industries, the service sector, and food industries. This results in an ambiguous policy towards shopfloor organization. On one hand, the unions need factory committees to show their power to the employees; on the other hand, these committees are very much geared to the needs of a nationwide trade-union policy concerning pay and social conditions.

Since the 1960s, however, increasing emphasis has been placed on shopfloor organization within the overall trade-union policy, although the resulting factory committees have not been devised as a means for collective bargaining in the workshop. The largest union of industrial workers, the *Industriebond FNV,* was one of the first to pay attention to issues at the shopfloor level, partly as a consequence of pressure from the newly-created factory committees.

lems in the workplace, informed *Science for the People* that workers at a chemical plant in Loch Haven, Pennsylvania have been collecting their own evidence, with the assistance of health professionals and scientists, on their workplace exposures to toxic substances, such as B-naphthylamine and burner's acid. In Massachusetts, workers at the Quincy shipyards known as "burners" will be undertaking their own health survey shortly to gather baseline data on their existing health problems, according to MassCOSH. Burners use torches to cut through sheet metals, like steel, and are exposed to such toxics as metal fumes – lead, zinc, nickel and metal alloys – and chromate-, vinyl- and epoxy-based organics.

Laying the foundation for these activities through worker education, many unions have produced publications and offer training and technical assistance through their health and safety departments. The Oil, Chemical and Atomic Workers (OCAW), United Auto Workers (UAW), Communication Workers of America (CWA) and International Association of Machinists (IAM) are among the many unions that offer booklets, fact sheets, newsletters and assistance in recognizing, researching and documenting hazards on the job.

The UAW has produced two excellent booklets: *The Case of the Workplace Killers: A Manual for Cancer Detectives on the Job* and *What Every UAW Representative Should Know About Health and Safety* ($1 each from UAW Purchase and Supply Dept., 8000 E. Jefferson, Detroit, MI 48214). These booklets explain how to gather and evaluate the basic data needed to determine whether extensive investigations on health problems, particularly cancer, is necessary. They also include useful information about common hazards, cancer, epidemiological studies, using OSHA, hazard recognition, bargaining for health and safety contract language, and extensive resources and information sources.

A Union Representative's Manual on Occupational Disease was published by the Ohio AFL-CIO and prepared by WISH. A useful reference for any worker, this book outlines the steps needed for a comprehensive health and safety evaluation of the workplace – from recognizing the health hazards at work and taking a detailed work and health history from co-workers, to proving exposure and gathering medical evidence, filing for compensation and engaging in legal action. Further occupational health resources are listed on page 34 of this issue.

These are only some of the activities on workplace health and safety coming from the shopfloor in the United States. If state and local right-to-know laws – which provide workers and communities with information about substances used by employers – are not superceded by weak federal legislation, worker health problems may be recognized beyond the shopfloor. And hopefully, with the right to know will come the next and most important step: the right to act.

–Joseph Regna and Leslie Fraser

Part of the increasing interest in occupational safety and health problems, therefore, can be explained by the increased emphasis on shopfloor organization. Another factor is the more general interest taken by the trade unions in occupational conditions (as shown by such terms as the "humanization of labor"). This interest stems from the increase in number and intensity of hazards, a direct consequence of the increasing complexity of the labor process. These hazards include chemical substances like vinyl chloride monomer, or asbestos, and various physical hazards. One Dutch union, the former Industriebond NVV (now Industriebond FNV) paid special attention to these issues as a result of two international conferences on such problems: the World Conference on Health and Safety, organized by the International Federation of Chemical, Energy, and Allied Workers (ICEF), held in Geneva in 1974; and the World Conference on Health and Safety in the Metal Working Industry, organized by the International Metalworkers' Federation (IMF), held in Oslo in 1976.

The Union of Industrial Workers FNV (IBFNV)

The IBFNV is the union that has formulated the most outspoken policy in the field of occupational safety and health. Its policy objectives discuss both general and specific goals with respect to the relationship between research and general government policy. The government policy requires that the government be notified, through reports, of the composition, the application, and the research done on adverse health effects of chemical substances and products. All MAC values have to be critically examined, with the lowest values adopted, and with regular adjustments made in light of the results of the most recent research.

To realize its goals, the union also pays attention to factory committees' knowledge of occupational safety and health. In addition to organizing courses and providing books and pamphlets, it is the responsibility of the trade-union officials and the factory committees to pick up relevant occupational safety and health issues at specific work sites. In the formulation of the issues the union provides committees with the information and assistance needed to research their own working conditions. When there are difficult problems anticipated, the union uses science shops or individual scientists as advisors. In the following section we describe one such project that resulted from cooperation between a factory committee and the Chemistry Shop in the City of Leiden, a project which illustrates the tangible benefits to workers from worker-scientist cooperation in investigating occupational safety and health problems in the workplace.

Practical Cooperation Between Scientists and Trade Unionists

Cyanamid International as a huge American multinational corporation with about 45,000 employees worldwide. It manufactures products for agriculture and dairy farming (such as artificial manure and pesticides), metal goods, and chemicals (such as additives for water treatment). In 1980, Cyanamid made a net profit of $159 million, $6.5 million of which derived from their Botlek plant (one of two in the Netherlands).

Cyanamid Botlek has about 330 employees, of which roughly one third work on the production line. The plant uses a large number of basic materials, some of which are highly toxic, such as hydrazine hydrate, dimethyl sulphate, epichlorohydrin, ethylene dichloride, dicyandiamide, m-butyl cresol, acrylonitrile, acrylamide, resorcinol, nickel sulphate, formalin, styrene, acrylacid, dimethylamine, ethylamine, and sulphur dichloride. The production processes are intricate and, in general, automation is at a low level. Thus, many steps in the production process, such as tipping chemicals, cleaning filters, taking samples, and tapping products, are done manually.

In the summer of 1980 research was initiated at Cyanamid Botlek, a plant with a long history of problems. Years of complaints, uttered in vain, caused the district union representative to urge the company to abide by the rules and regulations laid down in the collective agreement of employment, rules which were meant to guarantee workers a safe and sound workplace. Complaints from workers of poisonings had not been taken seriously, and complaints of the foul smell, and the excessive dust, led to actions in the plant on a number of occasions. Improvements were offered by the company but carried out only marginally, seemingly to placate the workers. The management hid itself behind obligatorily enforcing the use of personal protection material. Time and again workers and the union asked for the initiation of a serious investigation, and each time the management refused to cooperate in such a project. Research as proposed by the union was called "unjustified by the facts."

Continued on p.27

A Report of a Recent Survey

MIDWESTERN FARMWORKERS SUPPORT THE FARM LABOR MOVEMENT

by Ken Barger and Ernesto Reza

Alfonso Sala and his family of six left Brownsville, Texas, early one morning in June. The old family pickup with a homemade shell was packed with minimal clothes and equipment to last the family for the next five months. It took four days to reach Michigan, and the trip north included one day without meals, and a flat tire repair that drained the family's meager resources, money which had been earned collecting and selling scrap metal.

In Michigan, after a couple of weeks trying to link up with a crew leader in a migrant labor camp, the whole family, including eight-year-old Victor and twelve-year-old Gloria was bent over harvesting cucumbers on hot, dusty days. In three weeks, the labor of the whole family had earned $1,600. It was then time to move to Ohio to harvest tomatoes.

Since the tomatoes ripened late, the family again waited two weeks, drawing heavily upon their earnings. The next six weeks they spent in tomato fields earning $3,200. After odd jobs and a brief stint picking apples, the Sala family had earned almost its entire annual income and returned to their *colonia* in southern Texas. The children, already behind in their classes, entered school. Within two months, with no other work available, the family's earnings ran out.

For the rest of the winter, the family sought public assistance. But when Gloria came down with a sever respiratory infection and had to be hospitalized, they went into debt. Next May, as they prepared again to head north, the family was notified by the Internal Revenue Service that they owed $3,000 in back taxes because the grower for whom they had picked cucumbers for the last six years had paid them as independent "sharecroppers" rather than as employees and had not withheld taxes or Social Security. The family, already poor and sustaining a marginal existence, was now in debt for years to come.

* * * *

Alfonso is a quiet man with a warm smile and a pleasant manner. He says he is concerned about his children's future, and feels a loss of dignity when he is unable to support them and provide for them, particularly when they see much better lifestyles around them . . .

Continued . . .

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in Brownsville and in the Midwest where they work. Several years ago, however, Alfonso joined the Farm Labor Organizing Committee (FLOC), a labor union of Midwestern farmworkers. Since then, Alfonso and his family have changed. They are still poor and experience many problems, but the union has made a difference. Alfonso and his family more actively discuss their affairs and make decisions now, emulating the democratic structure of the union. Alfonso says he reads more now, and follows national and world affairs, also a result of his family's active involvement in trying to improve their own lives and the lives of other farmworkers.

The Farm Labor Movement in the Midwest

About 65,000 farmworkers like the Salas family come into the central Midwest every growing season to plant and harvest tomatoes, cucumbers, beets, strawberries, cherries, apples, and other vegetables and fruit crops. Most of these people are Mexican Americans who originate from lower Texas, though some have

moved their base in recent years to Florida where they can work citrus crops during the winter.[1]

Farmworkers are a hard-working people who make a significant contribution to producing the food Americans eat and to the agricultural economy in areas where they work. Most Midwestern farmworkers are American citizens, yet they experience among the most deprived conditions of any group in the country.[2] They are involved in strenuous and deforming stoop labor, experience child labor and chronic underemployment, have an annual income far below the poverty level, live in crowded and unsanitary labor camps, experience high disease and mortality rates, and are subjected to discrimination and unscrupulous practices.[3]

Few alternatives have effectively addressed farmworkers' deprived conditions. The agricultural business for whom they work has rarely taken the initiative in resolving basic living and working problems.[4] Labor laws have specifically excluded farmworkers, and where they are included standards are reduced and the laws not enforced.[5] The only solution that has historically proven to be effective is the farm labor movement, in the case of the United Farm Workers (UFW).[6] Where the UFW has contracts, parents earn enough to permit their children to go to school instead of having to work in the fields, and farmworkers receive medical insurance and other benefits which most other American workers take for granted. In those areas where the UFW has been active, wages and conditions for all farmworkers have significantly improved.[7]

Labor laws have specifically excluded farmworkers, and where they are included, standards are reduced and the laws not enforced.

FLOC is a sister organization to the UFW, and has organized over 3,000 farmworkers in the Midwest.[8] Recognizing that it is the structure of the agricultural system that deprives farmworkers, rather than individual farmers, FLOC had tried to negotiate three-way contracts with the large agricultural corporations and the growers. After Campbell Soup Company refused to even talk with the farmworkers, FLOC workers went on strike against all tomato fields supplying the company in Ohio. When the company forced growers to mechanize to avoid the strike, FLOC called for a consumer's boycott of all Campbell's products in support of the farmworkers. The rationale of the boycott is that the combined social and economic power of the public can counterbalance the relative powerlessness of farmworkers facing a large multinational corporation.[9] And, in fact, a recent scientific public survey* in Indiana revealed overwhelming popular support for farmworker rights and for the farm labor movement.[10]

LNS

A Survey of Midwestern Farmworkers

Campbell Soup and others have claimed that FLOC does not really represent Midwestern farmworkers.d And so a scientific survey was conducted with two purposes in mind: first, to identify the views of Midwestern farmworkers themselves regarding the farm labor movement, and second, to provide representative information about this group, in contrast to the nonrepresentative records of migrant and other social agencies.[11]

The survey focused on the estimated 15,000 tomato workers involved in the 1983 tomato harvest in Indiana, Ohio, and Michigan, and particularly on the estimated 3,000 Mexican American male heads of migrant households. Personal interviews were conducted with 38 randomly-selected individuals, each lasting an average of an hour and fifteen minutes. Statistical checks indicate that there is a 90% probability that the response patterns reported here would not vary by more than 13% at the most (and by 0% at the least). The following are several of the major findings of the survey.

LIVING AND WORKING CONDITIONS

Midwestern farmworkers experience very poor living and working conditions, which most other Americans would find unacceptable. They themselves feel they are forced to have standards that are much worse than

*"Scientific survey" as used here means that the survey respondees were selected so that responses indicate a statistically high probability of accuracy over the target population, as is explained later in the article.

Survey of Midwestern Farmworkers

Average age	36
Average family size	6
Average grade completed in school	7
Average years worked in farm labor	19
Average generations worked in farm labor	2
Average months of annual employment	9
Average total 1982 household income	$6,447
Proportion estimated to experience severely deprived conditions	95%
Proportion estimated to experience poor health	33%
Endorsement of basic labor rights	99%
Knowledgeable of the farm labor movement	45%
Endorsement of the farm labor movement	79%
Active participation in the farm labor movement	32%

other people in the areas where they live and work. The survey evidence indicates that this is indeed true. The average income for a family of six is about $6,000 and they generally can find no work for about three months of the year. About one-fourth have been put out of work by machines, and they perceive this as a substantial threat to their livelihood. Most have been in farm labor for several generations, and there are an estimated 3,000 children working in the tomato fields alone, resulting in substandard education. They are generally isolated from the rest of society while working in the Midwest, and are sprayed with dangerous pesticides on an average of about seven times a year. Farmworkers experience more health problems than other Americans, and experience particularly high rates of respiratory infections, dental problems, and neck and back problems. While most feel positive about their lives, they are not very hopeful for the future.

Support for the Farm Labor Movement

Midwestern farmworkers overwhelmingly support the farm labor movement. They almost universally endorse basic labor rights for themselves, such as safe and sanitary work settings, worker's compensation and medical insurance, and retraining or choice of mechanized jobs when machines replace field workers. A majority know about FLOC and the UFW, and many are aware of strikes and boycotts organized by these farmworkers organization, including the strike against Campbell Soup. Almost all (91%) approve of these organizations; 97% believe farmworkers should have the rights to labor organizing and collective bargaining; 91% think contracts should be negotiated with growers and agricultural organizations whose products involve farm labor; and about 85% approve of both strikes and boycotts to help farmworkers' conditions. About two-thirds are either members of FLOC and UFW or would be interested in joining, and about one-third have actively participated in strikes and other activities of the movement. The survey reveals a phenomenal level of endorsement and involvement in the farm labor movement. This is particularly true when compared with the proportion of people active in social movements like the Civil Rights Movement and the Peace Movement.

Impact of the Findings

The most important conclusion of the survey is that FLOC does represent Midwestern farmworkers, as it claims. These farmworkers largely endorse the farm labor movement, including its organizations, goals, and methods. Most Midwestern farmworkers see FLOC and UFW as viable means for achieving their unfulfilled standards, and many are actively involved with these movement organizations. In fact, about the only reservation expressed is that the movement takes years to achieve its goals, during which time they have to support their families. Scientific surveys have now established that both the public and the farmworkers themselves strongly endorse the farm labor movement in the Midwest. It seems clear that the only ones to oppose true self determination among farmworkers are those who have short-term economic gains in their cheap labor and deprived conditions. In this light, it should be remembered that most other American workers also experienced similar deprived conditions in the recent past; but the labor movement not only resolved basic problems but it also made important contributions to the national economy through increasing the buying power of workers with a rising standard of living. It should also be remembered that history shows corporations and growers rarely take the initiative in resolving workers' problems, and that effective improvements have only resulted when workers and the public unite for a better society for all, as happened with the UFW boycotts.[12]□

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QUESTIONING

Editorial Note: *The two articles presented here are recent attempts to grapple with the broad issue of the role of science and technology in our society. Both are adapted from talks: Steven Rose's from a debate in Britain, and Philip Bereano's from a lecture in Seattle, WA. They are also part of an effort on the part of SftP to frame (or reframe) questions of priorities in the direction of science, questions which we feel to be of paramount importance as we move beyond 1984.*

THE LIMITS TO SCIENCE

by Steven Rose

For the great ideological "spokesmen" of science, from Francis Bacon onward, science has always been without limits; about "the effecting of all things possible." Human curiosity, after all, is boundless. There seems to be an infinity of questions one can ask about nature. At the end of his long scientific career Isaac Newton felt, he said, as if he had merely stood at the edge of a vast sea, playing with the pebbles on the beach. What is more, because science is not merely about the passive knowledge of nature but about the development of ways of changing it, of transforming the world through technology, these same apologists offer us a breathtaking vision of the prospect of a world, a nature—including human nature—made over in humanity's image to serve human needs.

To speak of 'science for science's sake' is to mystify what science is and what scientists do.

It is only when one looks a little more closely at these visions that one sees that a science which claims to speak for the universality of the human condition, and to seek disinterestedly to make over the world for human need, is in fact speaking for a very precise group. Its universalism turns out to be a projection of the needs, curiousity and ways of appreciating the world not of some classless, raceless, genderless humanity, but of a particular class, race and gender who have been the makers of science and the framers of its questions indeed since Francis Bacon's time.

Steven Rose teaches at the Open University, England. He is the author of many books, including The Chemistry of Life *and* The Conscious Brain. *Most recently is the co-author of* Not in Our Genes, *which is reviewed in this issue.*

The ideology is powerful, and in the second half of this century has been of endless fascination to politicians as well as scientists.

Towards the end of the second world war, in the U.S., Vannevar Bush, whose life had been spent with "Pieces of the Action" of science, offered Presidents Roosevelt and Truman "Science, the Endless Frontier" as a vision of how the greatness and power of the U.S. could be indefinitely extended. In Britain the visionary Marxist tradition of J.D. Bernal inspired Harold Wilson in 1964 to speak of the "building of socialism in the white heat of the scientific and technological revolution" which has, rather than politics and class struggle, become the motor of the growth of Soviet society.

Against such claims for the limitless nature of human curiosity and the technoenthusiasms of the politicians, the anti-science movement of the last decades has cried a series of halts: halts to the "tampering with nature" of the nuclear industry and militarism; halts to the possibility of knowledge by the endless dissection of animals into molecules and molecules into elementary particles; halts to the restless experimentation implied by the very scientific method itself as a way of knowing the universe, as opposed to the contemplative knowledge offered by alternative philosophical systems.

I am not an anti-scientist in this, or indeed in any sense that I would accept. I want to argue, however, that we cannot understand science or speak of its limits or boundlessness in the abstract. To speak of "science for science's sake"—as if, to paraphrase Samuel Butler on art, science had a "sake," is to mystify what science is and what scientists do. This mystification, still often on the lips of the ideologues of science, serves to justify specific interests and privileges. Instead, we have to consider *this* science in *this* society. I shall argue that it is indeed limited, and that its limits are provided by a combination of two major factors. The first is material, the second ideological. I will consider each in turn.

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TECHNOLOGY AND HUMAN FREEDOM

by Philip Bereano

Most of us have been brought up to believe that the term "technology" refers to physical artifacts, like a typewriter or a heating system. But that view is not sufficiently helpful in analyzing technologies in terms of their social, political, cultural and economic ramifications. I prefer to define "technologies" as the things *and* the institutional (the social, political, cultural and economic) mechanisms which produce them and are affected by them.

Human beings have been involved in producing technologies and using and exploiting them for a long time. But now many of the effects and ramifications are much more massive than they were in the past and, in certain ways, not readily reversible. New terms such as "post-industrial society" or "technotronic society" are attempts to indicate that there is something qualitatively different about what is currently going on.

Emmanuel Mesthane of Harvard's former technology and society program wrote:

> New technology creates new opportunities for men and societies and it also generates new problems for them. It has both positive and negative effects and it usually has the two at the same time and in virtue of each other.

In certain aspects I think this observation is pretty shrewd, but I fundamentally disagree with his position that technology is neutral. David Dickson has called this the "use/abuse" model of technology. For example, I have a pen in my pocket which I can use to sign someone's death warrant or to write the Declaration of Independence. The uses and abuses of the pen are many, but the pen itself is neutral. Although this might be true about some very simple technologies such as ball point pens, I maintain that it is not true about most of the substantial and important technological phenomena which we find in our civilization.

The notion that technology is neutral is very important to the corporate ideology in America. This free enterprise model says that the problems associated with technology are what the economists call "externalities" – the unexpected, unintended side effects of things. The factory which is manufacturing something that we all want may be polluting the air or the water, but pollution is a side effect and is not intentional. Until society creates air pollution laws which internalize these external factors, such side effects will continue.

Because technologies are the result of human interventions into the otherwise natural progression of activities, they themselves are imbued with intentions or purposes. Current technologies, however, are not intended to equally benefit all segments of society. We are not all equally involved. Our society is a class society in which different people have different access to wealth, to power, to decision-making, to responsibility, to education, etc. We live in a society in which such access is differentiated on the basis of gender, of color and so on. Because technologies are intentional or purposeful interventions into the environment, those people with more power can determine the kinds of technological interventions which occur. Because of their size, their scale, their requirements for capital investments and for knowledge, modern technologies are powerful interventions into the natural order. They tend to be the mechanisms by which previously powerful groups extend, manifest and further exacerbate their powers. These technologies are not neutral; they are social and political phenomena.

The Appearance of Choice

These social and political aspects of technologies are often hidden behind the appearance of decentralized "choice." On the surface, modern technology offers society many choices, many sources of information.

Television, for example, appears to be a great decentralized resource with sixty to seventy percent of Americans using TV as their primary source of news. Yet as a technological system, television is one of the most highly centralized phenomena that we have. It is literally true that a very small number of people are able to determine what *is* and what *is not* news; how material classified as news shall be presented and how not; whether it will get thirty seconds or fifteen seconds or no time at all.

Census data are also available in a decentralized way to many people. Any person can walk into the library and get access to the computer print-out. But the census itself is not really decentralized. The actual form-

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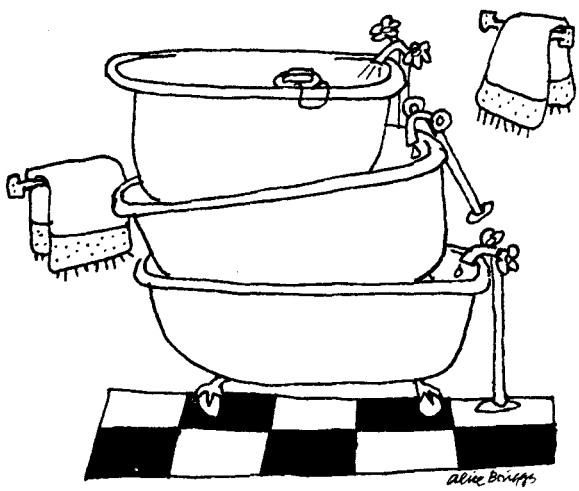


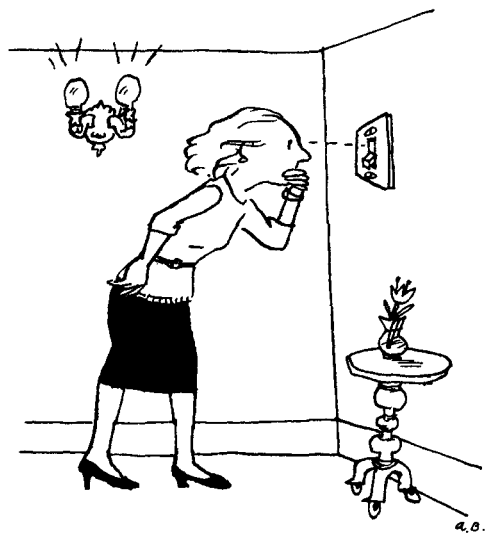
Alice Briggs

ing of the data pool, the decisions as to what questions will be asked and how they will be formulated are very centralized. These centralized decisions reflect the power differentials which exist in our society. Census takers ask how many bathtubs there are in a household (of interest to the American Porcelain Institute) but they don't ask questions which are of particular interest to me or to you. This appearance of access to information and of choice also occurs in the transportation system.

As David Dickson has said about the automobile, they give you tremendous numbers of choices: color, white or black wall tires, digital or sweephand clock. But the important decisions, like what kind of propulsion system it's going to have, you don't have any choice about. The fact is there have been propulsion systems, such as electric or steam, that have been technologically feasible for over half a century. Yet they do not in any real sense exist for people. In fact, it is not practical to have electric cars today because technologies are not individual components but systems. The automotive system is designed for gas combustion cars. We would need to have a totally different kind of support network—completely different service stations—if a hundred million electric cars were on the road. This happened to a small degree with an increase in diesel cars. One's ability to get fuel, top service, and knowledgeable mechanics changed dramatically. Without the whole technological infrastructure, which is as much a part of the technology as the artifact of the car, you cannot have an electric car. It is not a real choice. But I *can* have a car with whitewalls if I want. Dickson claims that this is a very common manifestation of modern technology. One's choices only appear to be decentralized.

Control and Understanding of Technology

We live in a society which styles itself to be democratic. How are we to reconcile the fact that the technological values of efficiency, expediency, and high powered knowledge and science, tend to involve a relatively small number of people? Academics, government and corporate officials routinely make important decisions that have impacts upon all of us, but over which most of us have relatively little control. And it is not only control. I think that our society is historically unique because for the first time the overwhelming majority of people do not even pretend to understand how their life support systems operate. What actually happens when you flip the light switch on the wall? In many earlier societies, whether we may now ridicule their beliefs or not, people thought they understood how things important to them and to their culture worked and why. The reason this is important is that what technology has really produced—and I think this also has relevance for human freedom—is a very profound sense of alienation. I mean it in the Marxian sense not in the pop-psychology or pop-sociology sense of alienation. Alienation is the sense that something is going on which is "other," apart from what I am. Most people have a very pervasive, inchoate, unrealized alienation in their day-to-day life.



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The workplace is a good example of a situation where most of the technology that people use they are powerless to make choices about. Each week thousands and thousands of women are told that they are going to

Continued on p.20

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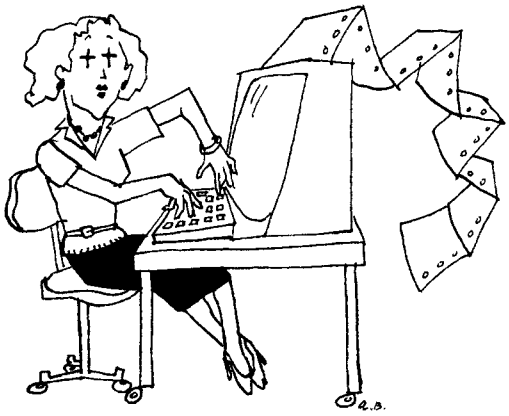

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TECHNOLOGY

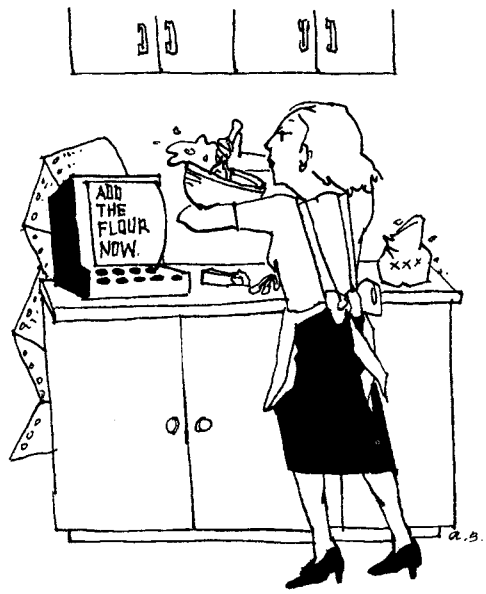
Continued from p.18

become word processors and that their typewriter is going to be replaced by a word processor. They have absolutely no control over the phenomenon. And that phenomenon is more than just getting a new high powered machine to do what they used to do. Technology, in this case, is not just a machine. It is a whole social milieu and involves a very important redefinition of roles and functions. A woman who did typing and filing, answered the phone and interacted with people, also had a certain measure of control over the arrangement, flow and pacing of the various activities. In this example, she is now being transformed into a person who will sit eight hours a day in front of a cathode ray tube and "word process." She will do so whether or not it hurts her eyes or her overall health. This person's job is being substantially degraded; the whole notion of control, the sense of autonomy, no matter how limited it might have been under the earlier situation, is being taken away, all under the guise of a new technology.

Most of us learned that, in the industrial revolution, people invented productive machines and then gathered workers together to use them in factories. But actually the factory was a social system which *preceded* many of the new technological mechanisms. It was designed for the social goal of controlling the workers, regulating and rationalizing production (at the very least because the entrepreneur did not know how to make cloth and wanted to control the operation of those who did).

There are two objectives a capitalist has: productivity, and control of the workers. Only one of them has been generally presented as being the reason for all these changes. We can see that today in the arguments being made for things like word processing are these neutral-sounding "increased productivity" arguments. When corporations advertise in the general press—the *New York Times, Atlantic* or *Harper's*—they talk about productivity in such a way that the readers will not conclude that these people are actually scheming to further control workers.

For example, high tech industries offer a limited range of jobs in which average pay levels are low. Most of these industries, largely un-unionized, have lots of low-paying, boring, repetitive unskilled jobs and a very few flashy engineering positions. Yet, when the promoters of high tech talk about the need to increase productivity in this society, they want people to view that position as neutral, good and progressive. So they say things like, "progress is our most important product." But they do not talk about how the industry will affect the workers and their workplace. We have all been subjected to a tremendous barrage of attempts to sell us computers. Such efforts inevitably engender in us a fear that our children will be technologically inadequate, if they are not "computer literate." But most people do not need computers. They are not writing books, analyzing large masses of data with correlation and regression statistics. What are the companies telling these people? They are telling these people that a computer will help manage their finances, which, for most people, means balancing a check book. This is a third grade skill: the addition and subtraction of whole numbers. The mistakes made are mostly entry mistakes which computers will not avoid. The computer is a two thousand dollar abacus.



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I believe that most computer users of the future will be word processors and not highly educated high tech people. There will be some of the latter but there will be ten unskilled laborers plugged into a computer for every one creative person who is working on a novel and wants to be able to justify the margins as the work progresses.

Another area in which I have done research is household technology—or kitchen technology, for instance. Without painting any kind of conspiracy theory, the overwhelming decisions about household technology, their development, their deployment, have been made by men who do not use, have never used, and do not want to use these technologies. Here again, there is a tremendous dichotomy between the people who are making those kinds of choices and, at least demographically speaking, a totally different group of users.

Utopian Visions vs. Decreased Possibilities

There are writers such as Cullenbach, LeGuin, and Bookchin who offer a political, utopian vision of a different kind of society and a different way to organize the "good life" socially. They would use technological systems very different from those which are currently manifest around us. They would be much more conducive to the fulfillment of human values by a large number of people, increase human autonomy and decrease alienation, put more of a premium on altruism and less on selfishness and privatism. I think they are structured on a set of values preferable to those I see imbedded in the dominant technology around us.

But utopian means "nowhere." You cannot wake up one morning and find that liberation has occurred. It is a very long and intricate kind of process to raise the consciousness of people so that they can develop that kind of autonomy. When people criticize Marcuse, for example, they say he is elitist because he claims he knows better what people want than they themselves. The point these critics miss, however, is that Marcuse is quite firm about the fact that humans have the potential for autonomous decision-making. But he also realizes that in this highly industrialized society, most people have had that sense of their power and their ability systematically stripped from them, not only through their socialization (so that the ideologies they believe tend to disempower them), but through the realities in which they find themselves, which give them relatively little freedom of movement.

I will conclude with a quotation by Lewis Mumford. Mumford was very romantic about technology and values, with the result that he is not terribly helpful to us. But in this quotation I think he shows tremendous insight. He is talking about automation, but it is really about technology in the larger sense. He states:

> It has a colossal qualitative defect that springs directly from its quantitative virtues. It increases probability and it decreases possibility.

Alice Briggs

In other words, there is something wrong about the qualitative aspects of technological phenomena, something, he says, which springs directly from "their qualitative virtues." That is to say, the power that technology has in the quantitative sense reduces quality. One of the things that modern technology claims to do, for example, is to make available to masses of people experiences which were once reserved for the few, such as the opportunity to have tomatoes in January. In the early part of this century you had to be someone like Andrew Carnegie to have a tomato in January. Now anyone can have a tomato in January just by going to the supermarket. But the quantitative virtue—the ability to produce week after week millions of tomatoes—has altered, must alter, the quality of the tomatoes you can buy. The tomatoes we get at Safeway are intentionally not the same as the tomatoes that Carnegie ate, because the tomatoes he ate were grown in Cuba or Mexico and specially transported, or grown in special hot houses. But you cannot do a million of those a week. In order to have the mass phenomenon of tomatoes in January, the technological adventure had to change the essence of what the tomato is. And the mass phenomenon means that certain technological events become very probable, and alternative possibilities are decreased (e.g., the internal combustion engine overwhelms the electric car).

Since technologies are systems of hardware *and* social institutions, the phenomenon is linked increasingly to concentrations of power—a threat to our existence as a truly free people. □

A Two-faced Policy

NUCLEAR SECRECY AND NATIONAL SECURITY

by Catherine Thiel Quigg

For over thirty years, the U.S. Department of Energy has aggressively promoted a technology here and abroad that can give nuclear-weapons capacity to any country with a civilian nuclear reactor.

Yet despite its active promotion of nuclear technologies, the Energy Department has plans to limit public knowledge of nuclear power in the U.S. by restricting the dissemination of a broad range of unclassified nuclear information. Under a proposed new rule (10CFR, Part 1017), federal agencies would have widened authority to classify previously unclassified information, and the Defense Department could withhold certain kinds of unclassified technical data with military and space applications.

The Energy Department's proposed rule first appeared in the *Federal Register* in the spring of 1983, and public hearings were held in Chicago, Washington, D.C., and Denver. Because of adverse comments from a wide array of citizen groups and individuals, the rule was revised as of August 1984, and written comments on that revision are still being accepted for review as we go to press.

Spokesperson Trisha Dedik Chico of the Energy Department's Policy Office says the earlier version was revised into new proposed regulations rather than final regulations "mainly because of critical comments." She said most of the 150 comments received opposed the lack of specificity in the definition of nuclear materials and the wide powers given the Secretary of Energy. She said the new version of the rule attempts to remedy these criticisms. Chico acknowledges that certain critics of the bill oppose its underlying concept of restricting nuclear information, but says the Energy Department is only implementing Section 148 of the Atomic Energy Act, passed by Congress in December 1981, requiring the Department to prohibit the unauthorized dissemination of certain unclassified but sensitive information with respect to atomic defense programs.

Spokesperson Jo Ann Williams, also from the Energy Department, says that, in light of the comments on the revised version, it is not clear at this time when the next version can be expected, nor whether it will be the final proposed version of the ruling. Nonetheless, the process is well underway to implement the ruling in some form.

Opponents fear repressive restrictions, conforming to this legislation, will weaken the ability of citizens and states to monitor the safety of nuclear programs, undermine essential research, and violate the Constitution. Universities are concerned they might be legally responsible for protecting information that has been on open library shelves for years. Hugh E. DeWitt, a nuclear scientist at the Lawrence Livermore National Laboratory in California, says the regulation "would fit neatly into the mad world described by George Orwell in his book *'1984'*" because it would prescribe a system of classifying what the Energy Department says is unclassified information.

The question of legality has been raised. The Energy Department rule appears contrary to the spirit and intention of the 1968 Nuclear Non-Proliferation Treaty (NPT) which commits the United States to facilitate "the fullest possible exchange of equipment, materials and scientific and technical information for the peaceful uses of nuclear energy." This concept is difficult to reconcile with a policy of restricting the American public's access to even unclassified information.

The Energy Department may insist the new rule applies only to military nuclear materials, but that argument ignores the intrinsic link between commercial and military nuclear power. Many political decision-makers

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and some scientists had previously been misled into the belief, now totally disproved, that reactor plutonium from civilian reactors could not be used to make nuclear bombs.

Any doubt that civilian reactor spent fuel could be used to make military nuclear bombs was dispelled on November 19, 1981 when F. Charles Gilbert, the Energy Department's acting deputy assistant for nuclear materials, told a Congressional committee that plutonium isotope separation could be used to purify plutonium obtained from commercial reactor spent fuel to conform to weapons specifications. This admission, however, has not halted the flow of U.S. nuclear technology and information to foreign countries.

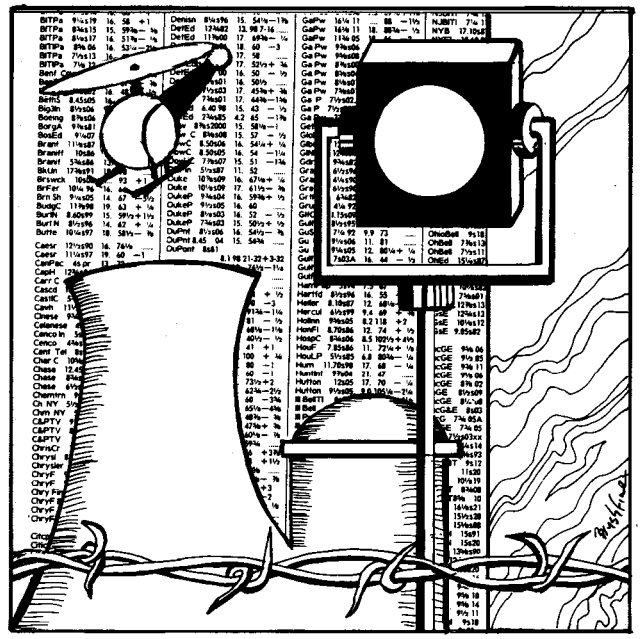
The United States, through its Export-Import Bank, has helped finance at least 51 foreign nuclear power plants in thirteen countries, as well as nuclear training centers in Japan and Romania. By 1982 the Bank had $6 billion in low-interest loans outstanding for international nuclear projects, and had exported over $19 billion in enrichment services.

The Arms Control and Disarmament Agency (ACDA) estimates that by 1985 about forty foreign countries will be able to make at least a few bombs from the plutonium in the spent fuel produced in their civilian nuclear reactors. These nations include Argentina, Brazil, South Korea, Taiwan, Pakistan, Iran, and Israel. By 1990 twenty-five more countries would have access to large quantities of plutonium, enough for 50 to 1400 bombs. The ACDA points out that both nuclear weapons and civilian nuclear energy depend on principally the same technology and use the same type of materials and production facilities.

Some argue that since nations that are party to the NPT pledge to refrain from using civilian nuclear technology to make atom bombs, it is therefore safe to export this technology. However, on just three months notice, NPT countries can withdraw from the treaty – even after they have received sensitive nuclear technology, training and materials. It is recognized that certain countries may join the NPT as a cover for gaining weapons capability.

The U.S. appears eager to share its nuclear information and expertise abroad. Since 1955 the U.S. has trained over 4,000 foreign nationals in nuclear physics, and provided training in recycling and reprocessing to scientists from seven countries, including India, Spain, and Taiwan. Hundreds more studied reactor technology and uranium enrichment. Almost 80 percent of the total U.S. contribution to the International Atomic Energy Agency, the UN watchdog agency set up for mutual nuclear protection, went to promotion of nuclear power rather than safeguards against weapons proliferation.

Rather than censor the flow of unclassified information to Americans, the U.S. should recognize the failure of NPT because it is based on a false premise. The NPT does not, and never can, restrict the spread of



Keith McHenry/Brushfire

nuclear weapons because *it* is the vehicle for the spread of nuclear technology and nuclear weapons materials. There is no way to adequately control nuclear weapons proliferation while promoting the spread of civilian nuclear reactors. Even the pro-nuclear Committee for Economic Development, based in New York, concluded in 1976 that "the proliferation of nuclear weapons capacity would not be contrary to the letter or the spirit of the NPT." The argument that the U.S. must continue to promote civilian nuclear technology so it can dictate nuclear safeguards is specious. No country, including the U.S., should spread a dangerous technology, capable of destroying the human race, in order to dictate safeguards.

To prevent nuclear proliferation, the Energy Department must concentrate on foreign governments, not American citizens. Congress can assist by repealing Article IV of the Nuclear Non-Proliferation Treaty and recognizing the dangers in our policy of contributing to nuclear-weapons proliferation by spreading civilian nuclear technology.

Repressive regulations, such as the Energy Department's new rule, make a pretense of assuring the national security while taking away the rights of individual American citizens to make informed decisions about U.S. nuclear-energy programs. Limiting academic freedom and the free exchange of ideas in the United States will do nothing to lessen the growing stockpile of civilian spent fuel with weapons-usable plutonium abroad.□

LIMITS TO SCIENCE

Continued from p.17

Material Limits

The material factor is of course that of resource. Science costs money and, in the advanced industrial countries of Europe—East and West—and the U.S.A., consumes anything from 2-3% of the Gross National Product (GNP). From 1945 to the late 1960s, science was expanding at an enormous rate, an exponential growth with a doubling period of 10-15 years or so. An historian of science, Derek de Solla Price, pointed out that the doubling rate had been constant from about the 17th century on. It became fashionable in the 1960s to calculate that by the 21st century, every man, woman, child and dog in the world would be a scientist and the mass of published research papers would exceed that of the earth. But like population growth, scientific growth could not continue unchecked.

There is an infinity of questions one can ask about the material world — which ones are relevant at all is strictly historically contingent.

Something had to stop, and indeed it did; from the late 1960s on, in most countries, the growth of science as a proportion of GNP slowed, halted or was even, in Britain, reversed. More importantly, however, funding of science research is not merely limited: it is *directed.* Of the 2-3% of GNP Britain has spent on science since the 1950s, close to 50%, year in, year out, has gone to military research. The figure is now about 53%—the highest for many years, and much more, incidentally, than is spent by any other western country except the USA—compare France's 35%, Germany's 12% and Japan's less than 5%. If you want to know why so much scientific endeavor is directed to military ends, you must ask political questions about how the decisions are made. But there can be no doubt that this concentration on directing research towards military needs, and towards the industrial priorities of production and profit, as Hilary Rose and I have described it, profoundly shapes the direction in which science goes.

Apologists for the purity of science (although it is the purest of high energy physics that gave us the bomb) may argue that this is all technology—real science is unaffected by such directive processes. They are on shaky ground making this science/technology distinction, of course. The distinguished American organic chemist Louis Fieser invented that nastiest of conventional weapons, napalm, experimenting on it in the playing fields of Harvard during the 1939-45 war. He wrote about his discovery afterwards in a fascinating book called simply *The Scientific Method.* The argument that pure science is divorced from direction can't be sustained for a moment.

Take the triumphant progress of molecular biology these past decades. There have always been two broadly contrasting traditions in biology, a reductionist, or analytic and atomising one; and a holistic or more synthetic one. This latter tradition was strongly represented in the 1930s by such developmental and theoretical biologists as Needham, Woodger, and Waddington. There was a proposal to set up a major institute of theoretical biology in Cambridge which would have brought the field together. But the funding was to come from Rockefeller, and Rockefeller, under the guidance of Warren Weaver, decided that the future was to be chemical. They backed biochemistry and molecular biology instead. The double helix and all that followed from it from 1953 on was a direct result of that funding decision. Many people would argue it was a correct one, and I might well agree. The fact is that it changed the direction of biology by a deliberate act of policy. Rockefeller's decision is thus comparable to those being made routinely by government and charitable funding agencies as they decide which are high priority areas to back, and which should not be supported. One of the things that is clear from that fact and from the combined efforts of Richard Nixon and Jim Watson in the 1970s to "cure" cancer by the end of the decade is that the most exquisite molecular biology has brought us no nearer to controlling cancer, a disease many of whose precipitating causes are located in the chemical environment of our industrial society. The vast funds Nixon allocated *have* given us more and more molecular biology, though.

Ideological Limits

Let me move from the material to the ideological limits to science. The point I want to make here is not just that we get the science we pay for, but that at a deeper level, what science we do, what questions scientists consider important and worth asking at any time—indeed, the very way they frame the questions—are profoundly shaped by the historical and social context in which we frame our hypotheses and realise our experiments. Let me spell this out at three levels.

First, we can only ask questions we can begin to frame; the role of chromosomes in cell replication and genetic transmission was unaskable until there were microscopes powerful enough to see the chromosomes, as well as a genetic theory to be tested—the technology and the theory came together at the beginning of the present century.

Second, not all scientific facts are of equal value. There is an infinity—in the strict sense of the term—of questions one can ask about the material world; which

ones are relevant at all is strictly historically contingent. To give an example, in 1956 Sanger published the complete amino acid sequence of a protein, the first time anyone had done it. It took him about 10 years. That it was insulin, rather than any of the other 100,000 odd human proteins, or the thousands of millions of other naturally occurring proteins, was fortuitous. It happened to be a relatively small molecule and available pure and in bulk. Within a few years several other proteins were sequenced, each time to a great, but diminishing scientific fanfare. Today anyone can do it within a few weeks with an automated machine. But is anyone going to *want* to determine the structure of *all* naturally occurring proteins—or even all human ones? There is a law of diminishing returns, to all except stamp collectors, and sometimes, Ph.D. students. So a new fact—the sequence of another protein—is nothing like as interesting as the first protein facts were. There's a limit to how many such facts are wanted, and most protein sequencing projects are scarcely worth a research grant these days.

Third, and at a much deeper level than either of the two previous points, there is the issue of reductionism and its alternatives. The mode of thinking which has characterised the period of the rise of science from the 17th-century minds is a reductionist one. Reductionism holds that to understand the world requires disassembling it into its component parts, and that these parts are in some way more fundamental than the wholes they compose. To understand societies, you study individuals, to understand individuals you study their organs; for the organs, their cells; for the cells, their molecules; for the molecules, their atoms . . . right down to the most "fundamental" physical particles. Reductionism is committed to the claim that this is *the* scientific method, that ultimately the knowledge of the laws of motion of particles will enable us to understand the rise of capitalism, the nature of love, or even the winner of the next Derby.

The fallacies of such reductionism should be apparent. We cannot understand the music a tape recorder generates simply by analyzing the chemical and magnetic properties of the tape or the nature of the recording and playing heads — though these are *part* of any such explanation. Yet reductionism runs deep. For Richard Dawkins the well-springs of human motivation are to be interpreted by analysis of human DNA; for Jim Watson, 'What else is there but atoms?' The answer is: the organizing relations *between* the atoms, which are not strictly deducible from the properties of the atoms themselves. After all, quantum physics can't even deal with the interactions of more than two particles simultaneously or predict the properties of a molecule as simple as water from the properties of its constituents. Beginning as a way of acquiring new and real knowledge about the world — from the structure of molecules to the motions of the planets — it has become an obstacle to scientific progress.

So long as science — in the questions it asks, and the answers it accepts — is couched in reductionist and determinist terms, understanding of complex phenomena is frustrated. A reductionist science, I believe, cannot advance knowledge of brain functions, or solve the riddle of the relationship between levels of description of phenomena such as the "mind-brain problem," which Western science is almost incapable even of conceiving except in Cartesian dualist or mechanical materialist terms. Reductionism cannot cope with the open, richly interconnected systems of ecology, or with integrating its scientific understanding of the present frozen moment in time with the dynamic recognition that the present is part of an historical flux, be it of development of the individual or of evolution of the species.

Failing to approach the complexity of such systems, reductionism resorts to more or less vulgar simplifications which, in the prevailing social climate become refracted into defenses of the *status quo* in the form of biological determinism, which claims that the present social order, with all its inequalities in status, wealth and power, between individuals, classes, genders and races, is 'given' inevitably by our genes.

The Question of Ethics

I want to conclude by referring to the one limit to science I have not yet mentioned, and that is the *ethical* one. Ethical issues in science have been repeatedly discussed in recent years. They take several forms. On the one hand, some claims have been made that certain types of knowledge are too dangerous for humanity in its present state, and therefore some types of experiments should not be made. For instance, nuclear power,

"We want you to do some pure disinterested fundamental research into something immensely profitable."

or gene cloning are considered to present hazards which make it inappropriate to pursue them experimentally. Or, research on the so-called 'genetic basis of intelligence' might reveal biological 'facts' which would be unpalatable. On the other hand, it has been argued that the conduct of certain types of experiments, for instance, those which cause pain to animals, or for that matter to humans, contravene absolute moral principles and should not be performed. All of these considerations may be regarded as limiting science.

The argument that pure science is divorced from direction can't be sustained for a moment.

From what I have already said it should be apparent that I have a rather complicated response to that rather abstract approach to ethics. For me, the resource and ideological questions are paramount, and most ethical questions eventually break down to ones about priority and ideology. For instance, there has been a lot of attention given to the ethics of *in vitro* fertilization – should we or shouldn't we? To me, the question seems wrongly posed; instead, one should ask the prior question, which the *in vitro* fertilization techniques are presumably designed to answer: how can we increase the number of wanted, healthy babies? If I ask that question, I also begin to ask what prevents wanted, healthy babies surviving. I note that there is a severalfold greater chance of a baby not surviving if it is born to a mother in poverty, or in the manual working class than if it is born to a wealthy or upper-middle class mother. And so if we want to save babies, I conclude, we can do so best by applying known social, economic and health care improvements to deprived geographical areas, and classes. *In vitro* fertilization is a method which is of relevance to a small number of relatively privileged mothers. The language of priorities says that we shouldn't get excited about that new set of techniques until we have addressed the question of how we save babies we *know* statistically will die from lack of application of quite simple preventive and health care measures.

That is an ethical question, but it is also one about politics and economics. Personally, I wouldn't do research funded by, or with obvious applications to, the military. I will try to persuade as many of my fellow scientists as possible to take a similar ethical and political decision. But in the last analysis in a militarist society *anything* one does can be and potentially will be cooptable for military purposes. If we don't want war-oriented research, individual ethical decisions are not enough. We need the *political* decision not to finance war research.

Similarly, I accept the case made by the animal liberationists that it is undesirable to use procedures likely to cause pain or distress to animals – though in the last analysis I owe my prior loyalty to my own species, and to argue otherwise seems perverse. I care more about saving people than saving whales. But a vast proportion of the animal experimentation done in Britain is either for relatively trivial commercial purposes – for instance, developing new drugs when it is at least arguable that there are enough or even too many drugs available already – when what is needed is not new magic drugs but a health-producing society. It is also true that a fair number of the animal experiments done in 'basic science' labs are, on close analysis, carried out in the pursuit of trivial or 'me-too' type research aims. Remember that the average scientific paper is probably read by only one or two other people apart from the editor of the journal in which it appeared and the referees. So part of my answer to the question of ethics and animal experiments is to rephrase the question in terms of whether the research is worth doing anyhow, animals or no.

So too with the question of 'things we're not meant to know.' These are often just things it isn't worth trying to know – like the sequence of every possible naturally occurring protein that I referred to earlier. But sometimes they are things which *cannot* be known because the questions are simply wrongly or meaninglessly phrased. As someone who has been involved in what has become known as the 'race-IQ' debate I have often been asked whether I am opposed to work on 'the genetics of average race differences in IQ' on ethical grounds. My response is that I am opposed to it on the same grounds that I am opposed to research on whether the backside of the moon is made of gorgonzola or of stilton. That is, it is a silly question, incapable of scientific answer and actually, meaningless in a strict sense. The question makes grammatical, but not scientific sense, because 'IQ' is not a phenotype susceptible to genetic measurements, and heritability estimates cannot be applied to average differences in phenotypes between groups.

All this is not to duck the question of ethics. There are issues of real choice and dilemma in medicine, in the use of animals, and indeed in some aspects of biotechnology, which cannot simply be reduced to issues of economics and ideology. They are few, but important, and they set limits to our science. How should they be resolved? In the last analysis, it seems to me, not by scientists playing god-in-white-coat and refusing to allow anyone else in on the decision, and not by committees of professional ethicists and philosophers. The only way of dealing with such issues is by democratic participation in the decision-making about what science is done. I believe that if we did organize our science in this way, not merely would new priorities set different limits to our work, but that we might also begin to see the makings of a new, less reductionist and more holistic, human-centered science. □

WORKER-SCIENTIST COOPERATION

Continued from p.10

In 1979 a general practitioner (GP) was approached by a number of workers with various complaints. In a report the GP indicated a possible connection with exposure to chemicals and urged the Labor Inspectorate to do more extensive research of labor conditions. But, as often happens to the messenger of bad tidings, the GP was summoned before the ethics committee by the doctor of the Labor Inspectorate and charged with harming the confidence in the medical class. Everything was put to work to clear Cyanamid's name.

The GP contacted the Leiden Chemistry Shop, a group experienced with research of labor conditions. In cooperation with the Workers' Group of the Shipyard *Vlaardingen Oost,* a method was developed in which the workers take a central position in the set-up and execution of research. Thus, workers can be prevented from being used merely as sets of data. Nor can there be talk of a one-sided flow of knowledge. With such a cooperative study, the emphasis is on combining workers' experience with production processes, and labor conditions with scientific know-how.

The Research

In April 1980, a research team was formed from the workers' group at Cyanamid Botlek, a district union representative, and the Leiden Chemistry Shop. The team was officially refused access to the plant, giving them a long preparation time. This time was used to gain insight into the production processes, the way the processes were conducted, the medical complaints, and the accidents and incidents that had already taken place. The most crucial research questions that followed this preparation were as follows:

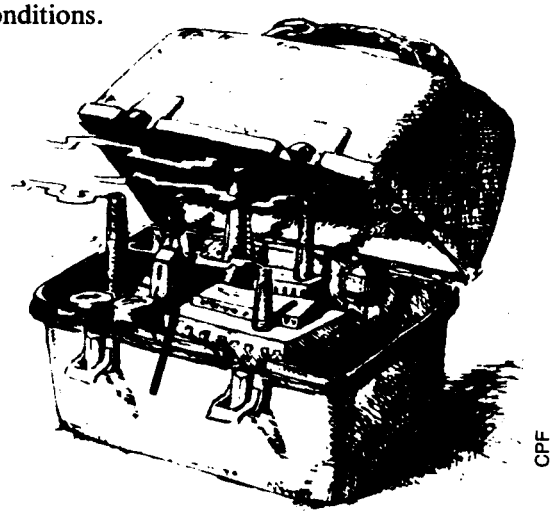
- Where and in which way do problems occur in the working situation?
- What are the medical complaints, and is there a connection between these complaints and the working situation?
- What steps should be taken to improve the working situation?

A questionnaire was drawn up in which the following subjects were mentioned:

- working conditions, with strong emphasis on exposure to chemicals
- medical complaints
- individual means of protection (availability, quality, applicability)
- information from the company about working with chemicals and their hazards and about safety rules and regulations
- level of trust in the management and in the company's medical service, absenteeism, the prohibition against working with certain chemicals or processes.

With the aid of this questionnaire, both an employee of the Chemistry Shop and a member of the workers' group interviewed the workers in their homes. This approach made it clear to the interviewed workers that it was a joint research project. Furthermore, it created an atmosphere of familiarity, essential to a good exchange of information.

The readiness of the workers to cooperate was striking. In all, 53 workers were interviewed. At first the results were organized into a brochure and presented to the workers. Later, in a meeting with the workers (in June 1981), it was decided that publicity would be used as a means of pressure to initiate negotiations with the management about necessary improvements in working conditions.



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Results of the Research

Before the research project began, Cyanamid was known to have problems with its working conditions. It was not until the data from the interviews were processed that the nature and size of the problems manifested themselves. It turned out that in many cases, during the course of the production process, contact with chemicals could not be avoided. Especially near dryers and spinners, in the packing of products, in tipping chemicals into reaction vessels, and in taking samples, the level of exposure to chemicals is very high. Workers often inhaled the chemical vapors and dust, chemicals often touched the skin, and one could "taste" chemicals on the lips.

In a few departments climate control was quite bad. Large temperature differences on each floor caused troublesome drafts and the humidity created a tropical atmosphere in the summer. Enormous noise and vibration hazards are caused by the spinners, stirrers, and ineffective exhaust systems.

The workers described the work load as heavy to very heavy. The staffing of the shifts seemed to be responsible, for in spite of the fact that a large number of standby personnel were available (from the high level

of absenteeism and days off), there was still talk of continuously understaffed shifts. Furthermore, to compound the workload, the nature of the work understandably requires a high level of concentration.

uestions about health complaints showed that skin, joint, and eye complaints (like blinding) occur frequently, in addition to a number of other medical problems. The toxicological literature was consulted to attempt to discover a possible connection between the medical complaints and the working situation. However, a more comprehensive research project is required to give more scientific weight to any such connection. In addition, literature about the effects of exposure to chemicals is limited. No data are available for some of the basic materials used at Cyanamid, and this emphatically holds true for products and byproducts.

There were an alarming number of materials used at Cyanamid which were thought to be cancer-causing. In addition, there existed the problem of simultaneous exposure to a variety of chemicals, a problem for which hardly any research data exist regarding effects on health. The causal connection between exposure and chronic effects on the liver, kidneys, nervous system, skin, and lungs is therefore extremely difficult to establish. In spite of these limitations, researchers have tried to make connections, as substantial as possible, between the medical complaints of those interviewed and exposure to chemicals at work.

The large turnover of personnel and the high level of absenteeism should be reason enough for the company to do something about working conditions. But the classic solution handed down by the company's medical service was to increase medical surveillance of workers on sick-leave. The management also sought to solve occupational health and safety problems by adapting the workers to the working conditions. It strongly emphasized the use of individual means of protection, and yet, in spite of that emphasis, these means were never sufficiently supplied. Maintenance of the existing means of protection was lacking. Safety equipment was often filthy, greasy, and dirty; it offered very little and very limited protection, and was awkward to use. Gas-protection suits were not available in the right sizes; rain-protection suits were used as acid-protection suits; and gloves were merely washed after use.

Where it existed, safety instruction was poor. In the Safety Precautions File, vital information such as "may cause death" and "may cause heart failure" was deleted. Hazard labels and stickers were often illegible or written in a foreign language (Finnish, for instance). Trade names for basic materials often could not be found in the safety file.

The attitude of the management was remarkable in the case of an accident. The worker was virtually always the black sheep. The company considered their equipment safe, so when something went wrong, it invariably looked for a guilty party. The safety representative would almost always end his or her speech with, "Let this be a lesson to us all." Finally, from the research results, conclusions were drawn and suggestions for improvements were made, all of which have been set forth in detail in the brochure.

Conclusions

The primary goal of the project was the improvement of working conditions at Cyanamid Botlek. The original idea was that this goal could be reached by means of general publicity (daily papers, etc.) and/or by union action. Another goal was increasing the consciousness of the Cyanamid workers to realize the possibility of correcting occupational safety and health problems. A related goal was the transfer of knowledge from scientific workers to the Cyanamid workers.

To reach these goals a worker-scientist cooperation was established. This cooperation and the possible methods used were hampered by a number of factors. First, entrance into the factory was not possible, prohibiting workers from being interviewed at the workplace, measurements of chemical exposure, or even a cursory workplace investigation. Second, time was a limiting factor. The scientists and workers involved in the project could only participate in their spare time. Last was the restricted scope of the research project, limited to chemical factors and safety measures, which was a direct consequence of the specific expertise of the researchers.

With regard to the specific research method of single interviews, it was considered that this resulted in the recording of isolated experiences, whereas group interviews may have resulted in a more collective consciousness. Also, there was only fragmented knowledge about the production processes involved. The list of questions also proved to be too general, so that specific points relating to one situation or process were missed. Perhaps questions relating to some of the processes or groups of functions, like maintenance workers, for example, would have been helpful.

During the project, expecially the interviewing phase, workers' interest in occupational safety and health problems did increase. However, the long period between the start of the project and the resulting end report made it clear to the workers that the initiative remained too much with the scientists and workers represented in the research group. This resulted, in turn, in a decrease in interest on the part of the workers.

In addition, a number of other problems arose. One was the intermediate pamphlet produced by the group. Since it lacked priorities for the suggested im-

provements, it resulted in a situation where some perspective on possible actions was gained, but there were no clear issues upon which to focus such action. Furthermore, workers were scarcely motivated to act on long-term issues. Carcinogenic compounds only affect workers after a long period of time, and most of the cancer victims are invisible because they no longer work at the factory at the time the disease appears. Also, problems having specific effects at or from isolated work sites are not easily made into issues for general action.

Another difficult—and major—problem was related to the structure of multinational corporations. If a group of workers has costly claims with regard to occupational safety and health problems, at what hierarchical level should action be directed? Planning does not take place at the level of plant management, and local management cannot make decisions involving large sums of money. So, a number of the improvements suggested by the project could not be addressed to the correct decision-making level because the Trade Union only deals with local management.

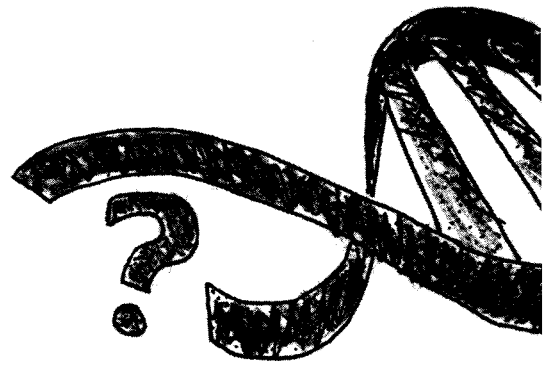
Despite these limitations, the project did accomplish some tangible goals. Improvements were realized in the production processes at the Cyanamid Botlek plant. However, in terms of money spent, these improvements were not very substantial. Those improvements that required investments or changes in production could not be enforced. The improvements that were made in production processes were related by management to the suggestions of MAC. This had the effect of making it less than clear that the performance of the cooperative worker-scientist research project actually had significant effects. (In fact, the MAC report and the cooperative report differed very little.) And, of course, this management tactic obscured the fact that the MAC research was started as a reaction to worker initiative in the first place.

While the ramifications of the project were limited by the national and international structure of the chemical industry, the initial research efforts did stimulate local changes in working conditions. They represent an important early success in an ongoing cooperation between workers and scientists in the struggle for improved occupational health and safety in the chemical industry, a result that hopefully can be generalized to all workplaces, working conditions, and people. □

book review

by Joe Alper

Not in Our Genes: Biology, Ideology, and Human Nature
by R.C. Lewontin, Steven Rose, and Leon J. Kamin
Pantheon Books, New York, 1984



Not in Our Genes is without doubt the best book available on the subject of biological theories of human behavior. In several hundred pages, it provides a general analysis of these theories together with detailed consideration of several specific ones from the viewpoint of the radical science movement. The value of this book is that it offers a unified framework for a political and scientific critique of a broad range of biological determinist theories.

An important strength of the book is the authors' use of insights into Marxist theory. Without getting bogged down in tiresome jargon or the mechanical application of outdated formulations, the authors show how dialectical thinking enables us to achieve a more realistic picture of the behavior of people, both as individuals and as members of society. In addition, Marxist theory illuminates the role that ideology plays in the creation, acceptance, and pervasiveness of scientific theories of human behavior. Moreover, this ideology influences the nature and content of the theories themselves.

The book can be conveniently divided into three parts. Chapters 1-4 consist of a general discussion of biological determinist theories, concentrating on their political and ideological nature. Chapters 5-9 focus on five specific categories of such theories and present a scientific critique of each of them. Chapter 10 attempts to go beyond the negativism inherent in a book that is concerned primarily with criticizing other people's theories. This chapter offers a view of human nature which suggests interesting answers to the questions concerning the relationship of the individual to society and the question of free will.

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The authors define ideology as "the ruling ideas of a particular society at a particular time. They are ideas that express the 'naturalness' of any existing social order and help maintain it." The overwhelming majority of scientists are employed by either the government, private industry, or universities. To a greater or lesser extent these institutions exert control over the type of research done. This influence can be direct, as in the case of efforts to improve a dishwashing detergent, or it can be indirect, as in the case of a junior faculty member who is influenced in the choice of research area by the desire to be awarded government research grants or a tenured position. As a result of these influences, the areas of possible knowledge investigated, the questions scientists ask within those areas, and the approach to the questions the scientists have chosen can all be directed in consonance with the prevailing ideology of the society. As the authors take great pains to emphasize, this control means that science is not objective; it does not mean, however, that the science is necessarily wrong or even that it is bad science. Darwin's theory of evolution was heavily influenced by the ideology of free-market capitalism, but this influence does not detract from the scientific merit of the theory.

Science itself is a social institution. Judgements about what constitutes science and about the merits of various scientists and their theories are made by other scientists. A scientific theory is wrong only after it has been shown to be wrong by other scientists. Consequently, if a scientific theory is in accordance with the prejudices inherent in the prevailing ideology, very often other scientists will not see or will ignore methodological and logical flaws in the theory that are apparent to other scientists who are consciously aware of the ideology. The theory will persist until the leading scientists in the field recognize the errors in it or until an improved theory replaces the older one. The history of biological theories of human behavior is replete with examples of theories filled with methodological flaws that were rejected only after years of widespread acceptance. Unfortunately, the biological theories described in *Not in Our Genes* are all still widely held by many scientists despite flaws similar to those found in the earlier theories.

Scientific theories are not only influenced by the prevailing ideology; they also can serve to provide evidence for the truth of that ideology. A central tenet of capitalist ideology is that each person is free to make his or her fortune in the free market. One of the primary functions of biological theories of human behavior has been to provide scientific justification for this and similar arguments and thus to explain and justify such phenomena as the great disparity in wealth between the upper and working classes and the disproportionately low percentage of women and blacks in the professions, science, and business. It is because of the pernicious use to which they have been put that so much effort, including the book under review, has gone into critiques of these theories.

In presenting a general critique of biological theories of human behavior, the authors concentrate on reductionism as the ultimate flaw in all such theories. Reductionism is the attempt to explain the behavior of a complex system in terms of the behavior of the component parts of the system. Thus, chemists use reductionism to explain the properties of a molecule solely in terms of the electrons and nuclei which make up that molecule.

The authors of *Not in Our Genes* believe that the ubiquitousness of the reductionist model in science can be traced to the role of reductionism in capitalist ideology, in which society is defined as the activities of individuals competing in the market. All that is needed is an understanding of individual behavior, for there are no separate features of society apart from the actions of individuals. Biological theories of human behavior are all of the extreme reductionist type. These theories assume that individual behavioral traits are determined by genes. Thus, once we understand the nature of this genetic control we will be able to understand both people and society. As the authors point out, this reductionist assumption is never questioned by the biologists. The works of psychologists, sociologists, and philosophers showing the errors of reductionism and the futility in trying to understand society by simply studying individuals are completely ignored.

The connection between capitalist ideology and biological theories of behavior is clear. Sociobiology, the theory that attempts to account for the social behavior of animals, including people, on the basis of the genetically-determined behavior of individuals, is an especially clear example. The traits that the sociobiologists of human behavior believe are the fundamental ones in determining human behavior include aggression, entrepreneurship, territoriality, and male dominance over females—traits that provide a perfect match for those deemed important in late twentieth-century capitalist society. There is little doubt that these particular traits were chosen as fundamental both because they are the traits that American and European sociobiologists recognize as the important ones required for success in the only society they are familiar with and because these scientists accept the ideology that maintains that the status an individual attains depends only on the intrinsic characteristics of that individual.

After their general discussion of biological determinist theories, the authors describe and critique five classes of these theories: the biological basis of IQ, sex roles, deviance, schizophrenia, and human social behavior (sociobiology). Each of these chapters presents enough of the technical science involved so that a nonexpert can learn enough to understand the theories in some depth and to appreciate the force of the technical critiques.

The chapter on IQ discusses the basic concepts of population genetics, explaining the concepts of genotype, phenotype, heritability, and correlation. The authors explain the difficulties of even defining intelligence and explore the question of whether IQ is a "real" biological entity that could be controlled by genes or whether it is an invented construct which has been defined only in terms of the values of our society. Examining the various studies which claim to prove that IQ is a genetically-based trait, the authors treat in detail the methodological flaws of these same studies, such as the fact that researchers assume that a pair of identical twins is treated in the same way as a pair of fraternal twins. They also relate the story of Sir Cyril Burt, the most famous researcher in this field, whose entire research over a period of approximately 30 years was based on nonexistent twins.

In dealing with the other specific biological theories that they discuss in the book, the authors follow a similar pattern, noting that in our society certain groups of people have less power, wealth, and prestige than others. They discuss the theories that account for these inequalities in terms of innate genetic differences between the advantaged and the disadvantaged groups and show both the flaws in these theories and that the only reason these theories have been accepted is that they are in accord with contemporary prejudices and ideology. For example, the fact that women do less well than men do on tests of mathematical and spatial ability has been explained by various researchers on the basis of differences in the structure of men's and women's brains, differences in the levels of sex hormones, and analogies with the behavior of other animal species, and by arguments based on the evolutionary history of the human species. The evidence for any of these explanations is flimsy at best; nevertheless, both the popular and scholarly press continually publish articles expounding these theories. As the authors argue, it is probably no accident that biological determinist theories explaining inequalities between groups become especially prominent when the disadvantaged groups become more militant and begin to struggle to achieve equality.

The final chapter of *Not in Our Genes* attempts to go beyond the reductionist models of the relationship among genes, the individual, and society. Reductionism is unacceptable because the biological laws governing the behavior of genes are not sufficient for understanding the behavior of people, and the behavior of people as individuals cannot explain the workings of society. Even interactionism—a theory which emphasizes the influences among all three levels—is insufficient. The authors argue that we must go beyond interactionism and recognize that individuals can change their environment and can affect society, and, in addition, that society can change the behavior of individuals. Even bacteria, by their metabolic processes, change their environment, and this altered environment affects the future behavior of the bacteria. It is only by achieving a detailed understanding of all levels of explanation, including biology, psychology, and sociology, and the interrelationships among these levels that we can hope to understand human behavior.

Books and articles attacking biological determinist theories usually conclude by exhorting their readers to struggle against these theories. *Not in Our Genes* concludes by suggesting that a dialectical materialist understanding of behavior justifies our belief in human free will and the possibility of a free society. In the authors' view, lack of freedom is caused by events being determined by one type of cause, be it a biologically- or culturally-determined one. If many different levels of explanation are needed to account for human behavior and if people indeed are capable of changing their environment and being changed by it, then no one type of cause constrains our behavior. The world is causal but our actions are independent of any one or even a few of the existing modes of causation. As the authors conclude:

> Our biology has made us into creatures who are constantly re-creating our own psychic and material environments, and whose individual lives are the outcomes of an extraordinary multiplicity of intersecting causal pathways. Thus, it is our biology that makes us free.□

book review

by Jack Strahan

When You Can't Sue the Government That Kills You!

Waiting for an Army to Die: The Tragedy of Agent Orange
by Fred A. Wilcox, Random House, Inc. 1983

Fred Wilcox tells the story of the human tragedy resulting from the use of Agent Orange in Vietnam and in the United States. He focuses on the three populations most affected by Agent Orange: Vietnam veterans, Americans exposed here at home, and Vietnamese.

Agent Orange was the military code name for a mixture of two chemicals, the n-butyl esters of 2,4-dichlorophenoxy acetic acid and of 2,4,5-trichlorophenoxy acetic acid. Known as 2,4-D and 2,4,5-T, they were used during the Vietnam War as defoliants in South Vietnam. These and related chemicals, called phenoxy herbicides, are the most common and effective chemicals available for killing unwanted plant growth. The manufacturing process requires mixing the two and adding inert ingredients. This process also results in the final chemical being contaminated with 2,3,7,8-tetrachlorodibenzo-para-dioxin, commonly known as dioxin. Dioxin has been called the single most toxic substance known to science, as it is carcinogenic and teratogenic (causes birth defects even years after parents' exposure) and kills fetuses. Although Agent Orange was used exclusively by the military, herbicides with the same ingredients have been and are now being used in the United States.

The author does an excellent job of explaining the continued use of phenoxy herbicides in the United States within the context of current political realities. Evidence of the dangers of dioxin contamination is solid and well established, and although the EPA banned the use of phenoxy herbicides in the United States in 1970, the ban was contested by the manufacturers, and was rescinded the same year. Until the mid-1970s, all research on dioxin was conducted by the manufacturing corporations (Dow, Monsanto, Diamond Shamrock, and Uniroyal), and by one independent, Bionetics Labs, which was subsequently indicted for submitting fraudulent test data on dioxin and other chemicals to the EPA. The chemical companies challenged the ban on the grounds that test data on the health effects of dioxin were inconclusive when applied to humans.

Some of this "inconclusive" data includes statistics which show that among Vietnam veterans, the incidence of soft tissue sarcomas (a form of cancer) deformed children, and liver diseases related to dioxin contamination are now thousands of times higher than normal. This is consistent with the fact that veterans suffered the greatest and most prolonged exposure to phenoxy herbicides and dioxin, sometimes as much as 5000 times the amounts discovered in Times Beach, Missouri. The World Health Organization has documented that, in Vietnam, one child out of every 197 is born with life-threatening birth defects, and they place the blame on high levels of dioxin and herbicide residue. This level of birth defects is even higher than during the thalidomide scare of the 1950s. In Alsea, Oregon, the U.S. Forest Service sprayed phenoxy herbicides one spring, and every pregnant woman in the area miscarried.

The crux of the issue of dioxin-contaminated herbicides is the great cost of compensating victims. The Veterans Ad-

Guardian

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ministration (V.A.) has taken the position that a veteran must prove it was specifically Agent Orange which caused personal health problems. Futhermore, the V.A. refuses to compensate or care for the children of Vietnam Veterans for any reason, claiming that is the responsibility of the veteran. It is against the law to sue the Veterans Administration, as it is to sue the U.S. Forest Service for its use of phenoxy herbicides. An individual must, ultimately, prepare to sue the corporate manufacturers themselves, with his or her own resources. The corporations and the V.A. are, however, using their considerable resources to belittle and deny the human dangers of herbicide usage.

Here, then, is the most powerful aspect of *Waiting For An Army To Die* that the general population has virtually no way to stop the use of herbicides, and that the government seems to feel no responsibility to its citizens when it comes to protecting them from corporate excesses or dangerous products.

This is both a powerful treatment of the entire herbicide problem, and a wonderfully compassionate look at the problems of the victims, both Vietnam veterans and others. It is an important book, well written and researched.

There are, however, two problems with the author's presentation. Because of the way they have been treated by the media, the V.A., and the courts over the Agent Orange issue, many Vietnam veterans are becoming angry. Wilcox feels that this creates anti-involvement and anti-American attitudes which can only embitter people, and which deny this country the ability to draw on the strengths and the resources of the Vietnam veterans. In reality, this entire fiasco may disillusion enough people to start the process of questioning the government, and demanding methods for achieving justice for the victims of problems like the dioxin situation.

The other problem is the author's acceptance of the myth that Agent Orange and Agents Blue, White, Green, Purple, etc., were used with the intention of denying cover to the Viet Cong and North Vietnamese Army. The size and density of the jungles of Vietnam are such that herbicide usage was a totally ineffective tool for this purpose; the spraying was primarily a form of chemical warfare against the civilian populace of South Vietnam. The maps of the spraying missions released by the U.S. Air Force show that targets were lowland, crop raising areas, economically important forests, grazing lands, rice and yam fields, and garden areas around rural villages. Defoliation was used as a method of forcing rural populations into the pacified hamlet program, where they could be controlled in a rigidly policed urban environment.

In light of the above explanation, which has gotten lost in the last few years as the military has tried to sanitize the history of the Vietnam War, it may be even more important than ever that books like *Waiting For An Army To Die* receive as much publicity as possible. Wilcox has documented much lying, stonewalling, and covering-up concerning the herbicide issue, an issue that poses a serious threat to the future of humanity and the world we inhabit.

Near the end of the book, one statement summarizes the terrible urgency and sinister character of the Agent Orange problem. It was made by a Vietnam Veteran in reference to Agent Orange, and bears repeating.

> I just want the American people to know something. They can write me and my children off. They can say we're all crazy, or we lost the war, or any bullshit they like. But what they don't know is that we are their future. What they dumped on us over there in 'Nam they will be dumping here tomorrow. What has happened to us WILL happen to them.□

resources

IMMIGRANT AND FARMWORKERS

Valiant Migrant Women, by Joy Hintz, with statements and stories from many migrant working women. 76 p., 1983, Aid and Friendship Inc., 500 E. Perry St., Tiffin, Ohio 44883.

The New Immigrants, a special issue from the Boston newsletter, *The Labor Page*. In English and Spanish. $1 from The Labor Page, 670 Centre St., Jamaica Plain, MA 02130.

Labor and Immigration, special issue of *American Labor* newsletter. American Labor Education Center, 1835 Kilbourne Pl. N.W., Washington, D.C. 20010.

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ENVIRONMENT

The Citizens' Nuclear Waste Manual, by Laura Worby. Designed for citizens, groups and state officials, it is a detailed guide to the regulations and technical issues involved in the selection of a disposal site for high-level nuclear waste. $20 for citizens, nonprofits and libraries from Nuclear Information and Resource Service, 1346 Conn. Ave. N.W., 4th floor, Washington, D.C. 20036.

RE:SOURCES, quarterly newspaper of the Environmental Task Force, 1346 Conn. Ave., N.W., Suite 918, Washington, D.C. 20036. The Task Force also sponsors the Toxic Assistance Project, offering citizens training in community organizing and leadership development, technical/scientific assistance, and legal counsel and nonlitigative support to endangered communities.

This Land Is Your Land, by Bernard Shanks, covers public lands policy from an environmentalist perspective. 320 p., 1984, Sierra Club Books, San Francisco, CA, $19.95 cloth.

A Killing Rain, by Thomas Pawlick, documents environmental and health effects of acid rain and government policies. 216 p., 1984, Sierra Club Books, San Francisco, CA, $14.95 cloth.

OCCUPATIONAL HEALTH

A Worker's Guide to Information Sources on Occupational Health & Safety, provides sources inside and outside the workplace, guides to NIOSH and OSHA publications, doing your own research and more. $5 each from TNCOSH, 705 N. Broadway, Room 212, Knoxville, TN 37917.

A Job Safety and Health Bill of Rights, by Rick Engler, photographs by Earl Dotter, 32 pp., $3 from Phila PO SH, 1321 Arch Street Room 201, Philadelphia, PA 19101.

First Line of Defense: Health and Safety Committees at Work, a ten-minute slide/tape presentation for use in teaching local unions how to set up and improve health and safety committees. Sale: $100. Rental: $35. American Labor Education Center, 1835 Kilbourne Place N.W., Washington, D.C. 20010.

Asbestos: Medical and Legal Aspects, by Barry Castleman. A comprehensive study and compilation of asbestos literature. Law & Business Inc., Harcourt Brace Jovanovich, 584 p., 1984, $60.

OSHA Under Reagan, a slide/tape show produced by the UAW showing how job health and safety has suffered under cutbacks and how local unions and community groups are fighting back. Available through UAW Education Dept., 8000 E. Jefferson, Detroit, MI 48214.

Lights, Camera, Action!, a guide to labor-related slideshows, films and videotapes from *American Labor*. Describes more than 400 labor-oriented AV programs, with an excellent section on occupational health. From American Labor Education Center, 1835 Kilbourne Pl. N.W., Washington, D.C. 20010.

Asbestos and Your Health, a 21-minute slide/tape show covering the history of medical research on asbestos, asbestos-related cancers, medical evaluation and prevention of asbestosis. Sale: $100 from MaryCOSH, 305 W. Monument St., Suite 301, Baltimore, MD 21201.

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