Great Expectations: the Politics of Biotechnology
To the Editor:

I want to thank you for the most incisive review by Carl Blumenthal of my book *Missing Pieces* in the Health/PAC Bulletin (March-April 1983). It is clear from his last comment (i.e., my omissions) that I may have made an error in judgement.

During the last 18 months I have published four books—one deals very explicitly with the Independent Living Movement, *Independent Living for Physically Disabled People* (Jossey-Bass, 1983), and one with sociopolitical issues, *Socio-Medical Inquiries: Recollections, Reflections and Considerations* (Temple Univ. Press, 1983).

As a result, I thought it was enough that I treated the matters mentioned elsewhere. In the eyes of at least one reviewer I was mistaken.

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United nations officials are declaring the current African drought more widespread and potentially far more devastating than the disastrous 1973-74 dry spell.

The area suffering most may well be the Horn of Africa, where the Ethiopian government is engaged in a long, bitter war with guerrilla movements in Eritrea and Tigre.

In 1952 Ethiopia, then ruled by American ally Emperor Haile Selassie, won UN approval for a federation with Eritrea.

In 1962 the emperor unilaterally abrogated the treaty and annexed Eritrea. The guerrilla movement, which had actually been founded the year before, grew rapidly. Ethiopia's continued on page 4
Notes & Comment

Over 40 percent of all U.S. workers are women, with married women the fastest growing group among them (at least before the Reagan Recession). By 1981, both spouses were employed in 52 percent of all married-couple families, with and without children.

What do such people do for childcare in the absence of any comprehensive state or national programs? Increasingly, apparently, many husbands and wives work different shifts so that at least one parent is with the child almost all the time. This is the surprising finding of a recent study by two sociologists at the University of Maryland, reported in Science magazine last February.

About 18 percent of all U.S. workers are on shiftwork, that is, they work in the evening, through the night, or on a rotating shift. But, the study found, among married couples in which both spouses work, at least one spouse is on shiftwork in 34 percent of the households. Ten percent of the dual earner couples with children work completely different hours with no overlap.

A 1977 study found that the husbands of mothers on shift work—frequently employed as nurses, waitresses, and telephone operators—were the principal caretakers for their children 30 percent of the time.

Such arrangements "solve" the childcare problem temporarily, but the social and emotional cost to both parents is often heavy. Children feel that cost, and they might also miss seeing their family together the way it appears in elementary school readers.

If the Moral Majority is worried about the disintegration of the family, providing daycare and eliminating poverty would be a good place to begin shoring it up.

Letter from the Editor

The response to our reader survey has been gratifying, both in numbers and in praise. Those who have answered are, of course, a highly self-selected group; they not only subscribe, they took the trouble to tell us what they think. But we like to believe their answers are at least somewhat indicative of general reader attitudes toward the Bulletin.

More people read the major article first, with shorter articles and Vital Signs a close second. More than half go through the magazine cover to cover (we were quite pleased with that; People magazine has larger print and smaller words and most of its readers aren't so engrossed).

The most common criticism was that the major article is too long. We will keep this in mind, and we are already soliciting more short pieces (those who write the longer ones have a lot to say, however, so we have to work on them too).

A number of readers found the prose glib or strident or both. A number of readers found the prose excellent. We will try to please all of them.

The Bulletin is used frequently in classrooms, as we suspected, and also in community, union, health education newsletters and advocacy work. We found this variety very encouraging, since our intention is to offer a publication which is of value to health professionals, activists, and consumers. This is not as easy as it might seem.

The variety of topics suggested for the magazine is vast; it would take us several years to cover them all even if we did nothing else, but we will certainly examine the list carefully when seeking out and selecting new material.

More respondents by far became acquainted with the Bulletin through friends than by any other means. This isn't surprising, given our limited resources for publicity. If you haven't shown the Bulletin to some of your friends who might subscribe, we hope you will. If every one of our subscribers gets us one more (or half an institution), the Bulletin will be self-supporting. If you can get two or three and bring the average up, that would be wonderful.

Our sincere thanks to those who have sent in the questionnaire. If you haven't yet, we would still welcome any responses.

Jon Steinberg
Continued from page 2

American and Israeli military advisers are gone, replaced by Soviet and Cuban personnel, but its war with the Marxist guerrillas for control of Eritrea's 3.5 million people and Ethiopia's only outlet to the sea drags on.

The following letter by one of the top medical officers of the Eritrean Peoples Liberation Front (EPLF), provides a revealing picture of how a grossly outgunned revolutionary movement attempts to improve health care to desperately poor people while fighting a guerrilla war.

Eritrea

As you know, we're a Third World country. Most of our problems are related to malnutrition, and in the background of course is the war. Plus in the past, four, five years we've had drought, which has really compounded the health problems. To deal with these we have a health system with three sections. The first one dealing with casualties of the war, the second with general medical services, and the third with medical education.

We’ve been providing services for ten years, and right now we have between two and three million people under our care. In 1978 we had control of most urban centers, but since our withdrawal we’ve been in the rural areas only.

The infant mortality rate had been cut greatly but it’s still one of the highest in the world: one out of three children dies before the first birthday, one out of two before the fifth birthday. Probably after the drought in Eritrea and other East African countries is over it will drop considerably, but right now what we’re trying to do is convince them that if they’re good enough for the townpeople, they’re good enough for them. Traditionally for themselves they’ve just grown buckwheat, wheat, corn, millet, and peas, made the cereals into bread and mixed it with a soup made from the peas.

Second, we are trying to deal with infections and infestations by preventing them and treating them. The health workers go around to instruct people in sanitation, particularly how to construct simple latrines, and work with the regular education system to provide basic health education. Because of the drought the water is on average three to five miles away. Still, because we think there will be enough to dig wells once the drought is over, we’re educating people now in washing habits. We’re also working on a prototype latrine with some people from Australia which we think will be acceptable to the people. Each village has an assembly which has grown up in the struggle and I think that because of their mass participation they will be able to spread the use of the latrines. Again, the only problem is the drought. We’re using a Swedish type with two compartments. When one is filled up it can be used for compost while the other is filling.

The most severe problem in the Third World and in Eritrea and the rest of East Africa particularly is schistosomiasis, an intestinal parasite. In a survey we did it was second only the diarrhea as the most common disease. And that wasn't a very sophisticated study; probably it is first. That is why I'm not so enthusiastic about the Swedish model. We have others which utilize flowing water that breaks down the excreta, and we’re modifying these to meet our conditions.

There is a wood common in Eritrea called min which the Australians think is very good for latrines, and we’ve sent it there for study. We have some clever people who are saying that using materials common in the lowlands we can produce a cheap cement.

The village assembly is basically the local government. Villages in Eritrea generally have between 1000 and 10,000 people, so they’re quite large communities. Each of them chooses one, two, or three people, depending on the village size, which they send to us for training for three months. Then we send him or her back to the village with basic equipment—needles, syringes, a boiler, some materials for first aid, and drugs.

After that we’re responsible for visiting him or her every week or at most every two weeks to provide supervision and on the spot training. The community can dismiss any worker for poor behavior, and shares part of the expense. Obviously because of the drought many communities can’t afford very much, so we currently bear 60 or 70 percent of the cost, but we feel its very important for the local population to contribute to the extent possible. If the village is really spread out we have two centers.

In the three month training we provide education on the common diseases, how to identify the symptoms, and how to treat them. We also give them some education in preventive medicine, particularly general sanitation, latrines. If it’s a swampland area where there is malaria, we explain the problem so that they can encourage the village to take action.

We also teach them how to participate in the care of the newborn. Usually the village prefers the traditional midwife, and in that case the health worker cooperates with her.

In the beginning we thought that anyone with common sense could be brought in for training, but now we say that people must have basic literacy so they can record births and deaths and disease. Grade four or five would be acceptable. We give a minimal amount of biology and anatomy in the program. There are some slides continued on page 30
This Competition Has Few Buyers

Although *Business Week* (October 24) is announcing the profits investors can reap from the new national health maintenance organization chains, workers appear are less enthusiastic about them.

Since 1973 all employers with 25 or more workers who offer a health insurance plan have been obliged under law to have an HMO option. Right now only three percent of the 21 million workers enrolled in plans take the opportunity to join one, according to a recent study by the Bureau of National Affairs.

The major reason may be cost. In 1981 the average monthly HMO payment when employee contribution was required totaled $12.77; for other health plans it was $7.21. With dependents the differential jumped even higher, $27.21 versus $18.96. Despite relatively greater benefits in HMO plans, this extra payment may be too much for many workers to afford, particularly in a time of wage cuts and a serious threat of unemployment.

Murder Most Fowl

The following article appeared on page A24 of the *New York Times* last June 9:

Langley, Va., June 8.—Officials at Langley Air Force Base said today that a cannon that hurls dead chickens at airplanes at 700 miles an hour is helping to reduce accidents caused by jets hitting birds. Maj. Dennis Funnemark said the device, called a chicken gun, was a converted 20-foot cannon that shoots 4-pound chickens into engines, windshields and landing gear to determine how much damage such collisions can cause.

Although the Reagan Administration doesn’t believe in throwing money at domestic problems, it obviously has no such reservations about throwing chickens at military problems. Since the above article appeared, Health/PAC has plucked information from high government officials indicating that U.S. intelligence agency reports are ruffling feathers in the White House. The U.S., they say, is already behind the Soviet Union in the key chicken missile field and the poultry gap is widening.

According to them the Soviets have developed anti-missile chickens which are particularly threatening because they cannot be picked up by U.S. radar units. This also creates considerable confusion. Satellite photos detected what intelligence analysts thought was a giant new Soviet base outside Krasnopolisk, but after careful research it turned out to be a collective farm.

“This means that any Soviet chicken coop could be a cover for a missile base and vice versa,” warned on Reagan Administration official who opposes all arms control agreements on grounds that they are unverifiable. The top-secret CIA study also says that the latest Soviet models have a throw-weight capacity sufficient to launch a two-ton chicken, should Soviet experts come up with one.

Egged on by these reports, Secretary of Defense Weinberger has apparently asked the President for $20 billion (“Not exactly chickenfeed,” noted one Pentagon analyst) to develop a superior American weapon as well as an anti-anti-missile-chicken, code-named Fox.

A Warning to Hospital Workers

*The Occupational Health and Safety Letter* reports that several Virginia hospital workers have developed respiratory disorders from shampooing carpets with concentrated commercial cleaners, according to state officials.

These shampoos contain many toxic substances, including trichloroethylene, perchloroethylene, naphtha, kerosene, and other petroleum solvents. They must be diluted as directed before use and adequate ventilation must be provided.

Wasting Away

Representative John Dingell of the House Committee on Energy and Commerce has published a new report entitled Hazardous Waste Enforcement. It comes to what *Exposure*, the monthly publication of the Environmental Action Foundation’s Waste and Toxic Substances Project, notes is a not very surprising conclusion, that “a strong, effective enforcement program” is the only way to stop illegal or improper dumping.

The committee report comes out of a two year investigation of hazardous waste disposal in New Jersey where, it says, organized crime is “in control of both solid waste carting” and the “illegal dumping” which continues to be rampant throughout the state. The Environmental Protection Administration’s efforts to control mob involvement and to regulate the disposal industry have been ineffectual, the report charges, and the EPA’s new “non-confrontational, voluntaristic”
approach doesn't have a chance of succeeding.

The committee's chairman is James Florio, a Democrat from New Jersey. He issued a related General Accounting Office report on hazardous waste sites around the country saying, "We were shocked to learn that the laws and regulations are in large part being ignored or are not being enforced at all."

The GAO reported that 51 of the 65 sites it examined were in direct violation of Federal and state laws. In Illinois, managers of 33 of 38 dumps checked were not complying with Federal requirements "that they monitor underground water near the dumps to assure there was no seepage into the drinking water."

Of the 8000 dump sites in the country, the GAO noted, only 24 have received final Federal approval. Representative Florio proposed an amendment to the Federal hazardous waste law which would require dump operators to "certify they were in compliance with the Federal requirements of their permits or shut down. A fraudulent certification would be grounds for criminal prosecution."

Clearly, even if such an amendment were to be passed—an unlikely prospect, since corporations want to dump their waste now, not when facilities are upgraded at considerable cost which would be passed on to them—to be really meaningful it would require much tougher policing of the 8000 dumpsites than the Dingell report indicates the EPA is wont to provide.

Nurses in Danger

Healthcare workers are well aware that stress is one of their profession's occupational hazards. Recently public health researchers have been providing data which corroborates this assumption.

One of the most extreme manifestations of stress is suicide, and a new study has found that the rate among nurses is exceptionally high, 50 percent greater than among all women workers. Ronald Katz of the Department of Preventive Medicine at the University of Illinois Medical Center reported in the October issue of the Journal of Occupational Medicine that of 2,157 female registered nurses in his study who died between 1963 and 1977, 41 committed suicide; the expected number for women workers would have been 27. The excessively high rate was largely due to suicides among nurses over age 50. No other cause of death was significantly higher among the RN's. These findings are benign compared to those of a recent study of women doctors, which found that their suicide rate is four times that of all American women, greater than the rate for male doctors.

As Maine Goes . . .

Who Knows?

Until last July nursing costs in Maine, as in most hospitals elsewhere, were buried in "inpatient routine care costs", a category that includes a patient's room and board, medical and surgical supplies, and rental of hospital equipment. Now, thanks to a comprehensive, well-organized Maine State Nurses Association campaign over many months, patients will know what part of the hospital bill went to nursing care.

Increasing consumer awareness of why they "rang for hours for a nurse who never came" is part of a national campaign by nursing organizations to promote their members' professional autonomy, dignity, and accountability. The American Nursing Association favors legislation to break out the cost of nursing services to reveal variations in intensity of care, demonstrate that these service generate revenue, and protect the nursing budget from slashing expected under the new Federal diagnostically related groups (DRG) system, which reimburses hospitals a set amount for each medical problem covered by Medicare regardless of the treatment given.

The Maine nurses association, taking advantage of its new sophistication in flexing "nurses power," is pressing for passage of another bill that would remove a major irritant. Like other state nursing associations and unions of hospital and health care employees, the MSNA has long been outraged that hospital administrators can use Federal funds to pay for consultation on how to beat back employee demands. Last year Congress banned the use of Medicare monies for such purposes. The MSNA and other Maine groups are pressing for state legislation that bars such funding under both Medicare and Medicaid and mandates fines and forfeitures of payments for any hospital found in violation of this rule.

The Chips Are Down in Silicon Valley

A strike by 1200 San Jose, CA nurses at four hospitals over comparable worth issues has ended. Some of the nurses had spent more than a year
Great Expectations

The Politics of Biotechnology

by Eric Holtzman

Most critical public discussion of “genetic engineering” and of other biotechnological matters, has focused on obvious “hot” issues—public and environmental safety, possible ethical problems in applications to humans, and the peculiarities of patenting living organisms and life processes.

Fueled largely by the momentum of the environmental and antinuclear movements, and the resurgence of religion, a vague undertone of disquiet has developed.

Much of the debate, however, has centered on peripheral and short term questions. This is unfortunate, since biotechnology has potentially explosive economic and political aspects—far from all of which are necessarily to be feared or opposed. Agricultural and medical practices are likely to be dramatically changed and important new productive capacities unleashed with major consequences, perhaps especially for the Third World. Concrete questions about who is to control biotechnology and how this control is to be exercised are already looming, promising struggles and shake-ups.

The discussion that follows is written from the vantage-point of a university-based cell biologist. Inevitably its perspective develops out of experience with biology in the U.S. I am aware of the ambiguities of technology and of the evils attendant upon overrelying on technical solutions to solve social problems. I do, nevertheless, believe that much of biotechnology should be greeted as potentially liberating, and as difficult to assimilate within current economic frameworks.

The idea that new technologies are to be resisted, reflexively, because the history of the last century teaches us that technologies tend to run out of control is both ahistorical and beside the point. Such positions do simplify matters and help energize opposition. They eliminate the need to weigh benefits and risks, or to evaluate the economic, political and cultural forces that underlie particular developments. But this approach tends to be based too heavily on fear, which can disable as well as mobilize.

Moreover, many of the most important issues raised in terms of risks are really forms of fundamental questions about how economic and political power is exercised and who, legitimately, has the right to make decisions with potentially broad social effects. I believe such questions are more fruitfully posed as such, rather than in the more mystifying terms of technologies running out of control.

What’s new

Our vision of biotechnology is dominated by news of progress in sophisticated genetic manipulation. In fact, recent advances are much broader-based and include many less spectacular, but still very useful, improvements in our understanding of cells and organisms and in our capacity to work with them. With increasing ease, rational approaches can be constructed to deal directly with diverse problems that researchers hitherto grappled with clumsily or in hit-and-miss fashion. The combination of versatility, relative simplicity, and potential low costs is the basis for the promise of biotechnology. These attributes also generate the growing pressures on current practices in research, the control and transfer of information, and structures of production and distribution.

Modern biotechnology draws heavily on longstanding, sometimes quite ancient, methods of agriculture, medicine, and industry. Selective breeding and related procedures, based on an increasingly refined understanding of heredity, have been fundamental to the establishment of present-day food crops and herd animals. Medicine has applied biotechnological approaches to produce vaccines and antibiotics for decades; medical personnel also use biologically based diagnostic procedures and extract drugs and hormones from biological sources. The production of alcoholic beverages is only the most widespread of a varied group of microbiologically based industries; sewage treatment is another.

As would be expected, the recent upsurge in biotechnology has largely flowed within agendas and production methods originating in this long history. This "conserva-
"Activism" is likely to diminish as the possibilities arising from recent research are explored and exploited.

What is new intellectually is the sophistication of techniques for manipulating biological material directly at the genetic level and the capacity to engineer particularly convenient cell populations—principally microbes and cell cultures—to produce materials that were previously available primarily from markedly less convenient, or inherently limited sources.

In the laboratory genetic engineering of bacteria has produced hormones and other medically or industrially valuable proteins of higher organisms. Hybrid cell lines, produced by fusing different cell types, have been used to generate monoclonal antibodies useful in diagnosis and therapy. Animal embryos, including those of humans, have been transferred and stored. The study of the cell and molecular biology of plants have come of age.

All this has excited enthusiasm which has carried over to a range of other activities in search of strains of organisms, enzymes, and other biological materials for industrial, medical, and agricultural use. This enthusiasm and the confidence that biological approaches have tremendous potential are probably the most important products generated thus far.

Many people, however, are convinced that this potential is primarily for disaster. Public doubts have centered on the possibility that laboratories might accidentally create microbial "gypsy moths" which would escape, propagate, and wreak havoc—cause cancer, an exotic plague, or devour oil fields.

This concern has been raised in the scientific community as well. When recombinant DNA techniques (the foundation of genetic engineering) were first developed as research tools, a broad and highly influential body of biological researchers imposed its own system of precautions and controls. Under the auspices of the National Institutes of Health (NIH), these restrictions by and large held sway for several years. Some communities, including Cambridge, Massachusetts—an early center of genetic engineering—attempted to develop their own regulations for research and applications of the emerging technologies.

The Decline of Regulation

No disasters occurred. Recombinant DNA techniques proved to be immensely powerful research tools. A few studies evaluating potential dangers produced reassuring results. Soon the scientific community decided that the fears were exaggerated and that all but a few of the usual applications of the techniques were safe. In the space of a few years virtually all the controls that had been imposed were effectively lifted. (The NIH did retain a review panel, one of whose jobs is to regulate field tests of engineered organisms; more will be said about this below.) At this point those few individuals in the scientific community who still argue in favor of controls must endure heavy opprobrium from their colleagues.

In truth, most applications of the procedures are as safe as more familiar industrial techniques, few laboratory uses pose much danger, and the possibilities of accidentally producing a monster are very low. But it should also be recognized that the regulatory structure was razed so quickly in part because people were impatient to get on with research.

Competition heightened the urgency. There were fears that some states, localities, and nations would gain a significant edge in attracting researchers by promising much laxer regulation. As the commercial potential of the new methods became increasingly real, this was no longer an academic question. Another factor was the strong, not entirely groundless, fear of regulation in our society.

This history has had several important consequences. One is that although the issues of regulation were debated primarily in terms of laboratory research, the outcome, a system of minimal regulation, may well be carried over to regulation of commercial activities despite the very important differences in scale and spirit between research.
The NIH is encouraging private genetic engineering corporations to seek approval voluntarily from the NIH field-test panel before testing engineered organisms outside the laboratory. However, the NIH panel is already facing familiar company demands that significant portions of the proceedings be conducted in secret, as well as charges of conflict of interest.

Congress is eager to step in, but its major concerns are stimulating investment, opening foreign markets, emulating aspects of Japanese government-industry cooperation, and taking up issues which carry political mileage such as possible “engineering” of humans. The Environmental Protection Agency’s view of its responsibilities is not yet known.

Another legacy of the history of regulation is that the issues were framed and resolved in terms of accidents and exotic laboratory creations. It is, however, not genetic accidents that should concern us most, but deliberate misuse of the new techniques and more mundane matters such as disposal of wastes and occupational safety. During the recent period relying on self-discipline, there have been a few publicized (and probably a few more unpublicized) violations of the rules by scientists whose only likely rewards were the ability to publish research findings a few months earlier. Temptation to cut corners and bend the rules will multiply with the addition of potential commercial advantages in speed in getting to market and minimization of costs. Recent history is not reassuring when such stakes are involved, especially when production is shrouded under the argument that irreplaceable “trade secrets” are at stake.

Dangers could, of course, be premeditated. Biological agents designed to devastate crops, herds, or humans can be created more readily than ever. It would be naive not to believe that this has played a role in both the Reagan Administration’s drive to re-legitimize the Pentagon’s chemical warfare programs and its claims that our “enemies” are using biological weapons—with the clear implication that we must rid ourselves of awkward and restrictive treaties so we can increase our own capabilities.

Another quite serious negative consequence of the history of regulation was that the embryonic experiments in modifying relations between the public and research scientists were terminated just when they were beginning to produce valuable results. The regulations were formulated and imposed at the Federal level, essentially administratively, and they were relaxed in similar manner. In the discussions of local legislation and regulation it was evident, in at least some cases, that laypeople in local government were quite capable of weighing expert advice and making well-reasoned judgements. This experience, which might well have turned into an exceptionally creative two-way interplay between science and society, was rendered irrelevant. The overblown notion that scientific matters are particularly difficult for legislators and the public to understand has been perpetuated. In addition, the precedent was set for minimizing local regulation of biotechnology.

Finally, this history gave scientists the sense—partly false, but with some real substance—that the emerging technology is truly theirs to control and dispose of. This, I believe, colored subsequent events—especially the auction of scientists and research departments that followed court decisions establishing that products and procedures of the new biology can be patented.

The Rise of Commercial Exploitation

During the past few decades, virtually all of the significant frontier research now being applied as biotechnology has been funded by the Federal government through the NIH and the National Science Foundation. The fruits of this research represent a remarkable collective effort, involving major contributions from tens, perhaps hundreds, of laboratories and thousands of people in several countries. Even though these laboratories and scientists were professing traditional competitive and individualistic attitudes and often engaged in frantic races to be first with a new finding, the structure and practices of research were highly cooperative operationally: information, organisms, and biochemicals were shared to an extraordinary degree. Furthermore, through peer review and related practices the scientific community held considerable control over the directions research took; within understandable limits this control was exercised reasonably democratically.

Commercial exploitation of biotechnology, on the other hand, involves a rapidly growing number of competing private corporations. Some are well established pharmaceutical and agricultural giants. Others are new research and production companies, many of which sprung up in the giddy investment period of 1981-82, when it seemed that
In 1972 a research microbiologist for the General Electric Company, Ananda M. Chakrabarty, developed a strain of bacteria that could degrade and digest four of the major components of crude oil. The special strain of bacteria had been 'designed' by Chakrabarty to eat the oil in a spill and break it down into harmless by-products. When the oil slick was gone, the bacteria would disappear for lack of food. His strain of bacteria was developed using four naturally occurring plasmids — small, circular lengths of DNA that are not a part of a cell's chromosomes — each of which gave its parent bacterium the ability to degrade one component of crude oil. Using techniques that antedated current 'gene splicing,' all four plasmids were introduced into one strain of bacteria.

Because the microbe itself would be the product sold, Chakrabarty applied for a patent on his “invention”; without it, others could secure and reproduce the organism for their own use at will. The U.S. Patent and Trademark Office granted him a patent on the process by which the strain was developed and on the combination of the carrier and the bacterium, but it refused to grant patent protection on the organism itself, contending that living things other than plants (specifically covered by the Plant Patent act of 1930 and the Plant Variety Protection Act of 1970) could not be patented.

On appeal the Court of Customs and Patent Appeals reversed the Patent Office's decision; this reversal was affirmed in 1980 by the Supreme Court's 5 to 4 decision in Diamond v. Chakrabarty. The Court, led by conservative justices Warren Burger and William Rehnquist, made a narrow ruling, interpreting Congressional intent in the patent statutes to distinguish not between living and non-living but between “products of nature, whether living or not, and human-made inventions.”

“The patentee has produced a new bacterium with markedly different characteristics from any found in nature and one having potential for significant utility,” the Court said, “His discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under [the law].”

According to Monroe Price, dean of Yeshiva University's Cardozo Law School, the narrow statutory decision reflects the dilemma posed by a choice of either adapting outdated patent law (first written in 1793 and last revised in 1952) to present circumstances or awaiting further Congressional directives. Dean Price noted that the patent laws were written to protect property rights that otherwise would have to be protected in the form of trade secrets and at the same time to maximize advantage benefiting only a very few scientists and institutions.

The lack of concern with such issues in the scientific community has multiple roots. In some measure it reflects the involvement, actual or hoped for, of significant numbers of the intellectual leaders of modern biology in commercial ventures. Another factor is the lack of obvious, available alternatives to commercialization through private corporations and the numerous precedents for this route.

But equally important is the traditions of science itself, especially the pattern of competition, publication, recognition, and reward. The history of progress in lines of research fades rapidly from view as the latest results and interpretations accumulate. In publications and grant applications the sense of building on past accomplishments of others is much less evident than the stress on what is new and what disagrees with past viewpoints. Access to publicity via the proper journals, meetings, and connections plays a very important role in deciding who gets credit for what.

Small wonder then that it appears natural when scientists who take the most recent step in a line of research scramble, successfully, to establish claims to commercial profits millions of dollars in venture capital were available to anyone who wished to incorporate for genetic research.

This explosion of private investment fulfilled the theory under which the government supported basic research: public funding would ultimately bring practical benefits, with the private sector developing their commercial potential and reaping the profits.

There has been a bit of concern that the increased interpenetration of the academic world and the commercial sphere will unduly distort university life, subject graduate students to new forms of exploitation, perhaps choke off some of the openness and cooperation through which biology has thrived, and diminish government funding. There has also been some discussion in Congress about the degree to which government funds for basic research should be available directly to private, profit-making, high-technology enterprises, as well as about existing legislation aimed at providing research funds to relatively small businesses. Still, it is remarkable how little scientists and the public at large have been disquieted by the appropriation of a body of knowledge produced by a large scientific community, with public funding, for private economic advantage benefiting only a very few scientists and institutions.
PATENTING LIFE FORMS

Imimize wealth through property-based incentives. "How," he asked, "will property law change as the nature of wealth and property changes with the new information technologies?"

Clearly, other genetically engineered microorganisms may be patented under the Court's ruling. Indeed, about 200 applications had been made at the time of its decision in 1980. Whether other living organisms can be patented once they have been genetically altered remains to be decided.

In December 1980, President Carter signed the Government Patent Policy Act that sets Federal policy for patents developed under Federally supported research by universities, nonprofit organizations, and small businesses. The Act is designed to promote utilization of inventions resulting from Federally funded research and development, allowing universities or firms to patent discoveries and license them, subject to certain provisions to protect the public interest. Before the Act, each Federal agency had its own policy regarding ownership of inventions developed under its auspices; some permitted private, nonprofit institutions to own patents (subject to conditions to protect the public interest), while others retained the title, permitting anyone in the private sector to develop them for commercial use.

Of the 28,000 patents that the Federal government owns (and makes available nonexclusively), only four percent have been licensed for commercialization; in contrast, universities that issue exclusive rights have licensed one third of their patents. Stanford, the University of California-San Francisco and Columbia have secured patents for the Federally sponsored research in recombinant DNA techniques that are now used in gene splicing and genetic engineering, and stand to profit from licenses they may grant.

Patents, however, do not always lead to the use of inventions. For example, take Professor Chakrabarty's bacterium. According to Chakrabarty, now a professor at the University of Illinois, "G.E. has been sitting on it," an assertion the company does not deny. "We're not in the business of cleaning up oil spills," explained a spokesperson. So much for G.E.'s current advertising slogan, "We bring good things to life."

Hal Strelnick

Hal Strelnick is a physician teaching in the Social Medicine program at Montefiore Hospital in the Bronx and a member of the Health/PAC Board.

that are actually derived from the entire chain of research and hence the accumulated effort of many other people.

Furthermore, for all the effective cooperation among laboratories and the widespread networks of communication upon which progress has depended, biologists, like other scientists, lack organizations or other means for effectively promoting or even debating their common political and economic interests and concerns. Professional societies are grossly underdeveloped in this area and relatively powerful and influential groups such as the National Academy of Sciences are both too non-representative and too self-selecting to create a sense of actual operational community. The American Association for the Advancement of Science has more potential along these lines, but it is not regarded in the research community, at least its natural scientist component, as a "spokesperson." The fragmentation of the scientific community reflects, in part, strong traditions of individualism and scepticism toward anything that smacks of trade unionism, and the widespread conviction that the present system is reasonably just in rewarding merit. Such judgements have long been recognized as major determinants of the attitudes of intellectuals in societies like ours. It is also true that relative to sectors of society hard hit in recent years science, especially branches with military applications, has been well treated. This creates a feeling that those who speak for science are doing as well as can be hoped in influencing decisions.

The Distortion of Academic Life

The rush by private corporations to develop biotechnology has led them to establish various arrangements with academic institutions. These arrangements are initiated, most often, to obtain some form of privileged access to new findings, or sometimes to personnel. They provide significant amounts of money for basic research at the institutions in areas of general interest to the sponsoring corporations.

In addition, new private research enterprises have been intensively recruiting well established scientists and new graduates to work on lines of research with potential for profit.

Inevitably, these developments will alter the structure of scientific research. They do have some quite positive facets: formidable intellectual resources are being focused on important practical problems, redressing biases in favor of
basic—"purer"—aspects of science. Nice as it is to think of universities as truly independent havens of seekers after intellectual beauty, this is belied by their history. While traditions of academic freedom and the degree of university independence that does exist are very worth preserving, they are not inevitably threatened by vigorous concern with the needs of the broader society.

Still, the relatively rosy view of commercialization ignores the overarching problems arising from the roles and power of large corporations. More narrowly, there is certainly need to brake the intrusion of the corporate drive for profit or control into the academic world, and to protect the endangered public investments, which have been essential to maintaining diversity of activities and viewpoints in academia. Most directly threatened is the long-run health of biological research and the traditions of open exchange of information and open sharing of materials.

For the time being, corporations have been satisfied with relatively unrestrictive arrangements in their support of basic research at universities; limitations on publication or discussion are modest. Because the fundamental information is so widely available and the general nature of the problems most immediately challenging is so widely known, commercial control of research and information poses complex difficulties for the private sector. Moreover industry and the new research enterprises need ready access to fundamental research underway around the world and would hesitate to disrupt the flow by raising their own barriers.

The new research enterprises have constituted themselves with large enough groups of scientists to ensure vigorous interchange in-house. Some arrange extensive programs of seminars and visits from outside as well to keep abreast of the latest findings.

However even with the most optimistic assumptions about corporate self-interest in not killing the goose that lays the golden eggs, it is inevitable that much information and research material of the kind hitherto freely circulated among scientists will be sequestered entirely or enter public circulation at a much slower pace. This may occur minimally with respect to fundamental information about the nature of genes, but clearly it will apply to precisely the sort of details about convenient short cuts, tricks in procedure, useful materials, and the like that can be crucial to the success or speed of research. Much of biotechnology will be very difficult to "protect" with patents or comparable legal devices—too much information is already broadly available, there are too many alternative routes to the same goal, and too much of the most difficult fundamental work has already been done. Thus commercial success will depend largely on corralling talent and on relative speed in getting to market and maneuvering once there. This is already true in sectors of agriculture and the pharmaceutical industry. It is hard to imagine that niceties such as openness about tricks of the trade or sharing helpful mutant cell lines will survive such pressures indefinitely.

The future role of the Federal government is also in doubt. The Reagan Administration has been very concerned with keeping technology and information under wraps to maintain the American superiority considered vital to profits. It has already made several classification and secrecy forays into the academic world, purportedly to protect militarily sensitive technology. Given the importance of agricultural and medical exports to the national economy and American influence abroad, it is not surprising that government and corporate policymakers are obsessed with our supposedly slipping world supremacy in generating new ideas in such fields. Their temptation to "protect" discoveries by restricting the extensive international communication and cooperation that has characterized biological research will be very strong.

Prospects in Underdeveloped Countries

Given the centrality of agriculture in much of the Third World, biotechnology offers considerable promise for aiding in economic development and in the solution of health problems.

Many of the most important applications are relatively simple and inexpensive and do not require detailed mastery of all the most recent advances or elegant solution of remaining problems at the fundamental level; there are already plenty of scientists in many of these countries capable of doing much of the work if given the resources. Cuba, for example, is very actively pursuing a host of agricultural and medical projects; some of these, such as work to improve animal feeds and livestock breeding, are already paying off. For Third World countries to succeed with reasonable efficiency, however, they must have access to precisely the kind of information most likely to be increasingly restricted—practical details about the handling of economically important organisms.

Subtler problems also hinder their efforts. Too often the most experienced and best equipped scientists in the Third World received their training in industrialized nations and imbibed the perspectives and interests prevailing there. As a consequence they lack the motivation and the orientation necessary to tackle unglamorous but vital local problems. In addition, since so much of genetic engineering is
BOOM AND BUST AMONG THE BIOTECH BLUE (AND RED) CHIPS

Those who wish to follow the growth and development of biotechnology are better served by a subscription to the *Wall Street Journal* than one to the *New England Journal of Medicine* (*Science* and *Nature*, it is true, are required reading). Speculation—scientific, journalistic, and financial—is fast overwhelming the healthy scepticism of traditional medicine.

Gene-green fever began seriously in October 1980 when Genentech, the San Francisco gene splicing firm, opened its first public stock offering at $35 per share and watched the price leap to $89 the first day. The company got $36 million in new capital.

Five months later the Cetus Corporation of Berkeley, CA raised $115 million in the largest initial public stock offering in U.S. corporate history. Other biotech companies, including Enzo Biochem, Genetic Systems, Biotechnics, Ribi Immunochm, Biotech Research, Bio Response, and Genetic Engineering have enjoyed similar meteoric rises in their stock prices; as a group they outpaced the bullish 1983 market by some 40 percent.

But all that splices and clones is not green and gold. Southern Biotech, a Tampa, FL firm, filed for protection under Chapter 11 of the Federal Bankruptcy Act in June 1982 with $1.4 million in liabilities. This despite a successful blood component and interferon business. Toronto's Bio Logicals lost almost $1 million in 1980.

The brokerage firm E.F. Hutton also spoke too soon. DNA Science, its biotech holding company venture that was supposed to spawn subsidiary corporations wherever the hunted scientists were, spent two years getting organized and recruiting the prestigious Weizmann Institute of Science in Israel, the Battelle Memorial Institute of Columbus, OH, UC San Francisco's Dr. John Baxter, and Nobel laureate Christian B. Anfinson. The entire project then collapsed when Johnson & Johnson entered as a major investor and in exchange for its $5 million demanded exclusive marketing rights for any products developed. Other investors and the researchers involved weren't interested on that basis.

### WHO'S WHO AMONG THE BIOTECH COMPANIES

<table>
<thead>
<tr>
<th>Company</th>
<th>Leading Scientist(s)</th>
<th>Major Shareholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogen (Geneva, Switzerland)</td>
<td>Walter Gilbert, Phillip Sharp</td>
<td>Schering Plough, Inco (Int'l Nickel)</td>
</tr>
<tr>
<td>Cetus (Berkeley, CA)</td>
<td>Peter J. Farley, Stanley Cohen</td>
<td>Standard Oil of Indiana, Standard Oil of California, Nat'l Distillers &amp; Chemicals</td>
</tr>
<tr>
<td>Collaborative Research</td>
<td>David Baltimore</td>
<td>Dow Chemical, Green Cross (Japan)</td>
</tr>
<tr>
<td>(Lexington, MA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genentech</td>
<td>Herbert Boyer</td>
<td>Lubrizol</td>
</tr>
<tr>
<td>Genex</td>
<td>J. Leslie Glick</td>
<td>Koppers Co.</td>
</tr>
</tbody>
</table>

—Hal Strelnick
publicized in terms of success in being first with the most elegant solutions to the most basic problems, it is often hard for Third World researchers to build up their self-confidence. A sense of facing very bright, very rich competitors who have all the advantages can be disheartening even if the problem at hand is actually of little or no immediate interest to these "rivals." There are also problems in developing self-reliance among people with habits of purchasing "better" solutions from the industrialized world and receiving "aid" of various sorts from foreign agencies.

Matters, however, will not stand still. Difficult choices will be forced upon the countries of the Third World. One very probable effect of advances in biotechnology will be exacerbation of several focal imbalances in their relations with the industrialized countries. The Third World constitutes a crucial market for precisely the sorts of products and production techniques biotechnology is likely to affect first—agricultural materials such as foods, seeds and fertilizers; and pharmaceuticals and related medical materials. The poorer nations are also an essential source of land, labor and raw materials. In the short term, we can expect intensification of phenomena already underway in many of these countries: changes in patterns of landholding and crops, with attendant massive social upheaval; struggles between locally-owned industries and multinationals; competition among the industrialized countries; sales of products prohibited or restricted in the industrialized countries; and the flight of multinational capital to friendly, low-wage havens.

Longer-term prospects depend on the political future—most centrally on the degree to which countries of the Third World achieve governments committed to autonomous national development accompanied by broad social welfare.

The prospects also depend on whether some of the more dramatic possibilities of biotechnological agriculture are realized. It is not unimaginable, for example, that products now fundamental to the economies of various Third World countries such as sugar and some petroleum-derived chemicals will some day come to be produced by quasi-industrial microbiological techniques. This would render current production methods and sites increasingly unnecessary, and perhaps even obsolete.

More certain is that in the medium term, many of the diseases of humans, livestock, and plants that still afflict the Third World will become much more susceptible to large scale amelioration or eradication, at least insofar as scientific understanding of the responsible organisms and etiology is concerned. It will be increasingly obvious that the major problems are how to mobilize interest in the necessary research and how to overcome political and economic impediments to adequate public health measures, agricultural improvement, and veterinary programs.

Possibilities at Home

As already mentioned, the recent history of biology provides some interesting lessons concerning how curiosity is constituted and constrained. Our society evolved mechanisms, based on relatively generous support, appreciable autonomy, and relative democratization of opportunity, which unleashed remarkable scientific capabilities. There is much to learn from this experience of value in organizing intellectual work and maintaining high morale and productivity in many sorts of contexts and societies. On the other hand, scientists have effectively been insulated from control over and concern with practical applications of their work. Buttressed by the prevailing mechanisms for recruitment, training, and socialization of scientists, this has ensured that the issue of private appropriation of the collectively-produced, government-funded body of knowledge would not arise with any insistence.

It is disconcerting, but instructive for understanding the contradictory psychology of the middle class, that at a time when the very idea of government involvement in society is under heavy attack as inevitably ineffective and wasteful, almost no one offers in rebuttal the exceptional success of the government-mediated planning and investment that started, in the case of biology, over a century ago. What remains to be seen is how scientists will react to a future which
will bring sharp decreases in autonomy and in funding for many of them, as well as an atmosphere in which suspicion, secrecy, and occasional fraud are apt to increase markedly.

There is at least some hope for the development of countervailing movements within the scientific community, which does still retain a strong commitment to cooperation, openness, and international collaboration, and has potential political and economic leverage.

It would require implausible levels of conspiracy and control to keep biotechnology completely confined within present balances of economic and political forces. The experience of the last decade with electronics, especially computers, and with copying machines demonstrates how very difficult it is to entrap new technologies within the bounds of the legal devices constructed principally to protect previously dominant commercial interests—especially while at the same time supporting "free market" economics and international competition. An intensive effort is underway to devise patent and copyright formulas that will "properly" reward innovation in biotechnology. This may help funnel some profits to "deserving" scientists, universities and corporations, but at very least there is likely to be a long period of sustained. international competition which will be only minimally constrained by domestic law. U.S. antitrust laws are already being reinterpreted and reframed to facilitate cooperation in research among otherwise competing companies. Competition is heating up among the U.S., the Western European countries, and Japan—one interesting question that will probably be answered is whether countries like the U.S. which have a "lead" in the research end of biotechnology will be able to translate this into continued economic supremacy.

More concrete issues may soon emerge. Given the large social investment in the underlying research, public contention could arise over what products are brought to market and at what prices. This debate probably will concern medicine first. A likely harbinger of things to come, with resonant implications for the Third World, is the delay in aggressive development of a potential malaria vaccine caused by disputes over licensing rights. The potentials exist for dramatically lowering production costs for a variety of medical materials, increasing supplies of presently very scarce resources, and evolving effective, inexpensive diagnostic procedures. How these enter and alter medical practice cannot be clearly foreseen yet, but they almost certainly will contribute to the already heated ferment over the costs, organization, accessibility, and effectiveness of modern medicine.

In agriculture, the issues concerning Third World countries outlined above will be paralleled in industrialized countries; these are already foreshadowed in discussions of policies about diet, land and water use, natural vs. chemical pest-control, chemical fertilizers, and the like. Differences will probably gradually intensify as it becomes clearer that fewer and fewer choices are dictated by biological necessities and more and more by political and economic decisions.

It would be foolhardy to predict how all this will turn out. I started with the conviction that the engineering of organisms could prove an appreciably more versatile, more productive, and less distorting approach to important facets of certain large-scale economic activities when compared with the elaborate interference with environments these activities entail today. Whether these possibilities are realized depends principally upon the political future, but biological scientists have fewer justifications than ever for pretending that their laboratory life is separable from what goes on outside in the "real world."

It seems to me that scientists have particularly strong stakes and responsibilities in several of the key issues that will determine the short-term future of biotechnology. Paramount among these are matters of secrecy. Practices that inhibit or close off the flow of information either within national scientific spheres or internationally must be combated on grounds of both their practical effects and their violation of longstanding principles.

More positively, scientists and their institutions should vigorously support the few efforts now being made to...
BETTER LIVING THROUGH BIOTECHNOLOGY

What are the products promised by genetic engineering and biotechnology that have Wall Street and medical science pacing expectantly in the delivery suite waiting room?

The hope (and hype) embraces almost every commercially significant organic chemical from methane (a major component of natural gas) to perfume, as well as diverse biological "factories" such as dioxin-eating and hormone-producing bacteria. Last year the FDA approved distribution of human insulin produced by a genetically engineered bacterium. Biologically active agents such as interferon (naturally produced only in such minute quantities that its use in cancer and other treatment is prohibitively expensive) might be similarly "manufactured."

Design of such "magic bullets" is rapidly moving from the drawing boards to laboratories and hospital wards. Among these exciting most interest are hybridomas, fusion of antibody-producing white blood cells (lymphocytes) with permanently-growing white blood tumor cells (myelomas), that will indefinitely produce a single, highly specific (monoclonal) antibody that can recognize types of cells targeted for diagnosis or treatment.

University of Minnesota doctors have already tried this approach to protecting leukemia patients with bone marrow transplants against rejection of the body by the transplants (graft versus host disease). Monoclonal antibodies have also been used in conjunction with radio-isotopes to identify cancer cells missed by other techniques.

Gene splicing may alter existing vaccines, provide new protection against existing infections, and facilitate production of existing pharmaceuticals. A New York State Department of Health scientist searching for a vaccine against herpes has just developed a technique that might one day lead to a universal vaccine, incorporating into the current smallpox vaccine (vaccinia) genetic information which will stimulate the body's immune reaction to a host of viruses, bacteria, toxins, and parasites.

Below is a list of potential biotechnology products and their markets, determined by the proprietary research of Genex, one of the new biotechnology companies. These data were published in 1981, which is a long time ago in this field.

Scientists should also lose their inhibitions about publicly defending the benefits of public investment. They may well be driven to do so if they want to save their research programs and the educational and other institutions in which many of them work. If optimistic, one can imagine that this will lead many of them to question the policy of giving away the fruits of decades of biological research to enterprises whose primary interest is their own economic success.

One of the few beneficial aspects of the Reagan Administration's remodelling of the U.S. is likely to be widespread interest in experimenting with new forms of regulation and with new modes of interaction between the public and the private sectors. Despite their relative quiescence, there is a broadly based sense among scientists that what is
happening in their professional life and surroundings is dis-
tasteful and threatening; this sense is a potential source of
energy.
Allowing the market to be the principal determinant of
what is produced with the new techniques, and what the
products will cost, would have predictably unfortunate con-
sequences, but this is not inevitable. There are, after all,
major social movements demanding better nutrition,
cheaper and more accessible medical care, improvement
of the workplace or environment, and the like. As they come
to understand that the new biological technologies can con-
tribute to the goals they seek, they are very likely to press
more constructively for socially responsible use of these
technologies.

Specific issues where the concerns of such movements
parallel those of scientists concerned with the long-term in-
tegrity of their fields and institutions have begun to surface.
For instance, a recent suit to enjoin the NIH from permit-
ting field tests of genetically engineered microorganisms
has sharply questioned the capacity of scientists with com-
mercial connections or the desire for such connections to
disentangle their own self-interest from their judgements
about proposed tests, especially when the discussions are
carried out in secret.9

Such issues have many contradictory features and, it is
unlikely that many scientists will be comfortable allied to
movements with tenets and practices that seem unscientific
and obstructionist, or to groups so reflexively hostile to

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### BIOTECHNOLOGY PRODUCTS

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Product Lines</th>
<th>Current Value ($ million)</th>
<th>20 Year Projected Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amino acids (food enrichment and flavoring)</td>
<td>9</td>
<td>$1703</td>
<td>$5110</td>
</tr>
<tr>
<td>Vitamins</td>
<td>6</td>
<td>668</td>
<td>—</td>
</tr>
<tr>
<td>Enzymes (catalysts, drugs)</td>
<td>11</td>
<td>218</td>
<td>—</td>
</tr>
<tr>
<td>Steroid hormones (e.g. cortisone)</td>
<td>6</td>
<td>377</td>
<td>—</td>
</tr>
<tr>
<td>Peptide hormones (e.g. insulin)</td>
<td>9</td>
<td>264</td>
<td>1000</td>
</tr>
<tr>
<td>Short peptides (e.g. sweeteners)</td>
<td>2</td>
<td>4</td>
<td>2100</td>
</tr>
<tr>
<td>Nucleotides</td>
<td>2</td>
<td>72</td>
<td>—</td>
</tr>
<tr>
<td>Miscellaneous proteins (e.g. albumin, interferon)</td>
<td>2</td>
<td>300</td>
<td>1000</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>4 (classes)</td>
<td>4240</td>
<td>—</td>
</tr>
<tr>
<td>Pesticides</td>
<td>2 (classes)</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>Methane</td>
<td>1</td>
<td>12,572</td>
<td>—</td>
</tr>
<tr>
<td>Organic chemicals: alephatics</td>
<td>24</td>
<td>2738</td>
<td>—</td>
</tr>
<tr>
<td>aromatics</td>
<td>10</td>
<td>1251</td>
<td>—</td>
</tr>
<tr>
<td>Inorganic chemicals (ammonia and hydrogen)</td>
<td>2</td>
<td>2681</td>
<td>—</td>
</tr>
<tr>
<td>Gene preparations</td>
<td>3</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Viral vaccines</td>
<td>9</td>
<td>N.A.</td>
<td>—</td>
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</tbody>
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"scientific progress" as many are at present. But we are only at the beginning of what promises to be a long period of tumult. Just as we hope that scientists will come to understand their roles and possible obligations better, so we can hope that progressive movements will realize that fears of ambiguity and the new can lead to the surrender of what could and should be contested terrain.

1. A helpful brief review is Abelson, P.H., "Biotechnology: an overview," Science 219:611, 1983. The entire issue in which this appears (vol 219, no 4585) consists of articles outlining the range of current biotechnological approaches.
10. See, e.g. the editorial and discussion of the NIH suit in Nature 305:347, 349, 1983.
"Our Goal is Prevention"

An Interview with Nicaragua's Director of Health and Safety Programs

by Michael Fairfax

I first became aware of occupational health and safety issues in Nicaragua in the summer of 1982, when I met Mario Epelman, a consultant on workers' health with the Nicaraguan Ministry of Labor. Mario was touring Canada to learn of our successes in preventing occupational illness and accidents; he was not very impressed.

After viewing a multi-million-dollar worker rehabilitation center in British Columbia, he commented, “all the money is being spent to treat diseases, and very little to prevent them from happening.” His tour of a nearby university's occupational research center replete with costly equipment to measure workers' tolerance to auditory, respiratory, and tactile assaults of the industrial workplace evoked a more bitter complaint: “They waste more money on this gadgetry in this one place than we have to spend for health and safety in all of Nicaragua.” “What do I tell my comrades when I return to Managua?” Mario concluded with his customary dry humor, “That after a month in Canada I learned that capitalism is bad for workers' health?”

At the time of Mario's first visit, Nicaragua was taxed by two pressing problems, a severe flood had destroyed most of the banana plantations in the North, and the Somocista counterrevolution had just begun in earnest. When I met him again last May the first problem had been wholly eclipsed by the severity of the second. This time, at an international conference on occupational health and safety, he was in the company of Oscar Berrios Gutierrez, a young industrial engineer and the new director of health and safety programs in Nicaragua.

"We wanted to come here to talk about what we are trying to do to protect the health of workers in Nicaragua," Mario told me, “but we cannot talk about that without first telling everyone of the invasion of our country. Because if we cannot stop that invasion, everything else is..." He shrugged.

In one sense, it seems, the greatest threat to the health and safety of Nicaraguan and American workers is the same, Ronald Reagan and the U.S. military/industrial state.

Oscar Berrios is an intent, animated man. Although I did not put specific questions to him and we did engage in some dialogue, I was struck with a sense that he was trying to tell me a story. It was not a lecture, but had the quality of a narrative rather than a simple answer.

"When we took office in July 1979, there was a complete lack of data on occupational injuries," he began, "We didn't, and couldn't, know what the problems were. During the time of Somoza you could say there weren't any occupational health problems, because Somoza didn't pay any attention to that sector at all. It was accepted that you could get killed at work, you could get hurt at work and nobody did anything about it. So it was never seen as a problem or if it was, it was considered an individual problem. We have been trying since to create an understanding among our people in Nicaragua that occupational health diseases and accidents are a social problem, not necessarily the worker's fault."

Nicaragua's economic base is primarily agricultural. There is some mining, though the gold, silver, and copper have been largely exhausted in centuries of exploitation. There is also a very small manufacturing sector.

Health and safety problems are thus principally rural and agrarian. This is reflected in the Sandinista government's occupational health priorities: health risks of farm workers, toxic pesticides, lung diseases of miners, benzene derivative illness, and lead poisoning.

"Because the major difficulties we faced were lack of information and a lack of human resources," Oscar continued, "Where would we begin? We thought that, 'Well, what we'll try to do is at least deal with the worst conditions, to make them more tolerable.' We formed a cadre of workers who had the skills to diagnose the situation, to identify the worst problems. In fact, we started with only four inspectors in 1979. We were up to 62 in 1982, with 15 more coming in the first six months of 1983, all of whom have had almost four years of training in occupational health and safety.

Michael Fairfax is a Canadian freelance journalist specializing in occupational safety and health. He gratefully acknowledges the translation assistance of Margaret Hilson for this interview.
“In the beginning, when we went out to do our first diagnosis of the work places, we found that there was such a high degree of ignorance about health problems that education had to be our starting point. We found that workers had always known that there were risks, but they had developed a belief that these were an inherent part of the job, that there was nothing you could do about them, that if you wanted a job you just had to accept them as part of the package.

“Our big step after training the cadres was therefore to systematize what workers already knew about the workplace, to build on their own awareness, while giving them some new skills for dealing with problems. What we're trying to do is put the scientific and technological knowledge at their service.”

This goal was intertwined with the broad Sandinista social policy. The government officially declared occupational safety and health (which in its view is complementary to, rather than in conflict with, increased productivity) as one of its three major priorities, the other two being education and public health.

Although the absence of pre-revolutionary statistics makes it difficult to gauge their success in preventing occupational accidents and illness, the advances in education and general health have been impressive and well documented. The two year Literacy Campaign reduced the illiteracy rate from over 50 percent to under 12 percent. This has certainly boosted workers' ability to understand the hazards they confront. Consumption of basic foodstuffs (corn, beans, rice) has increased 35 percent on average, creating a stronger, healthier workforce. The incidence of malaria, a disease which afflicted 25,000 Nicaraguans (one percent of the population) in 1976, was cut in half, decreasing the overall mortality rate considerably. The anti-malaria campaign did not rely on chemicals—the Third World stock-in-trade, DDT, was rejected from the start—but instead over 75 percent of the population was mobilized for a three-day blitz of anti-malarial therapeutics. New cases were reduced 98 percent.

“In the course of classes that we held for workers,” Oscar told me, “we tried to get at the root cause of why they thought the way they did about work, illnesses and accidents. We would try to look at an accident and analyze it to decide what caused it, what were all of the elements involved.

“For example, of the 7,500 accidents that were reported last year for the whole country, 1,500 happened in one privately-owned sugar mill. We analyzed the accidents in this particular factory and we found that almost 50 percent of them were caused by machete wounds to the left leg. We then reviewed every single accident that had happened in that industry. After that we went over all of this with the workers and the union and they set up a training program. This was the first place where we introduced protective equipment for the workers. It started off with a model of what a baseball catcher would wear on his leg, and we kept adapting it and trying it out on the workers until we found the material that was most comfortable to wear and that would still give them protection, a sort of metal cage with cloth over it. That reduced the machete accidents over 60 percent in the one factory.

“It was a very similar situation in the mining sector. When the Americans ran the mines they did very well, and the accident rates went up and up and up. Now the mines are
run by friends of Nicaragua who have come from other countries, and there was a great decrease in the number of mining accidents—an amazing drop, in fact; every single month they decreased more and more. There's a mine where a great deal of our activity was carried out which has both increased production and decreased the accident rate. On the second anniversary of the Revolution, the workers at this mine celebrated with a display of the health and safety program at the mine; they were that proud of it. The people in the region came to analyze the situation, and everyone said, "Yes, conditions are better, but we can do even better." A lot of people helped work on that analysis—workers, people from the area, people from the ministries of Labour, Health, and Social Security.

"So now every time there's an accident in the mine every single miner hears about it, and they look at it as if something terrible has gone wrong. They have a very clear analysis of some of the causes. They might say, 'You know Pedro was in that accident; the scaffolding wasn't secure.' Or, 'Juan had an accident because he didn't watch what he was doing, and Guiseppe had an accident because the conditions weren't good.' The worker analysis also includes what the roles of the various ministries should be.

"In general, we've used statistics to give us an idea of where the greatest problems seem to lie. We then visit those workplaces and together with the workers develop a plan. This has been partly responsible for the decrease in accidents between 1980 and 1982.

"But right now we don't know very much about the magnitude of occupational disease. You know, we're confronted with a situation where the accidents face us every day and we have to respond to that situation. We have much more information available to us about accidents. We're certainly worried about the incidence of disease, but really don't know enough about it to be able to comment on how serious a problem it creates.

"At the same time, though, we've made a few advances in various economic sectors. For instance, we feel that in order to make a correct diagnosis of occupational disease we need to have at least three very important facts, the occupational history, an evaluation of the workplace, and a very good medical examination and history of the worker. I would say that we've made large strides on the first two; certainly we can do an occupational history and we now have most of the technical capacity to do an evaluation of the workplace and the environment. What we're still lacking is the medical sector capable of performing occupational medicine."

There have been painful tradeoffs which have held back progress. These are often most glaring in the eyes of North Americans, though it should be noted that the Sandinistas have been remarkably candid in acknowledging their problems. Margaret Hilson, who recently returned from a study tour of Nicaragua, recounted two examples of working conditions so bad that if they existed in North American activists would raise a clamor to have the operations shut down.

"I saw x-ray workers who had no lead aprons," she said, "They knew the risks they faced, and they chose to face them because they also knew that the patients needed the x-rays, and that Nicaragua lacked the foreign exchange to buy the lead aprons." In 1982 over 50 cents of every Nicaraguan export dollar went for interest and repayment of the $1.6 billion foreign debt, just one of Somoza's many disastrous fiscal legacies.

At a textile mill she visited, "The noise levels were so high that workers knew they would eventually suffer hearing loss as a result," she related, "but they were proud of the factory. It had been bombed by Somoza, and they had rebuilt it by cannibalizing parts, eventually getting a third of the machines running. The factory is vital because it's the only one in Nicaragua capable of producing cotton material.

Don't eat, don't smoke while the fields are being sprayed or have recently been sprayed.
## HEALTH: A QUICK COMPARISON

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<td>Infant mortality/1,000</td>
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<td>Hospital beds (persons/bed)</td>
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<td>410</td>
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<tr>
<td>Population/doctor</td>
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<td>560 (1975 data)</td>
<td>2065</td>
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<td>Population/nurse</td>
<td>130</td>
<td>234 (1975 data)</td>
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### NICARAGUA: 1977-1982

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<td>Health budget, cordobas (000,000)</td>
<td>113</td>
<td>373</td>
<td>1231</td>
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Sources: WHO, World Bank, Statistics Canada, DHEW, World View 1982 Yearbook, Instituto Historico Centroamericano

Otherwise the country would have to import textiles even though it grows cotton.

"The workers look on their hearing loss as another form of war wound, another sacrifice that must be made for the Revolution. They are not masochistic, but they take pride in having to make such a sacrifice."

"The biggest budget item in Nicaragua is health," Oscar commented, "and we don't want it that way, so our goal is prevention, including occupational health and safety." In effect, however, the badly needed capital to finance public health programs such as providing potable water, shelter, protection against infectious diseases and so forth—what Oscar Berrios calls 'The first priority'—can only be obtained through individual sacrifices of the second priority, a safe workplace.

"With respect to agriculture," he told me, "there has been a law on insecticides since about 1950, but it has never been observed. We had a situation where workers didn't have any kind of protective equipment; where they knew absolutely nothing about the chemicals they were dealing with; and we found quite a large number of cases of massive chemical intoxication. One cause of ignorance was the absence of unionization in the agricultural sector; one of the first things we did after 1979 was unionize farm workers.

"The contamination from the use of insecticides wasn't just limited to the factory or to the fields where they were used. The whole environment was being contaminated. The poisons were being dumped in lakes and rivers. They were getting into the food chain, the fish: we found them in mothers' milk. A university study discovered that DDT contamination of mothers' milk was ten times what is allowed under international standards."

Many Nicarguan women, in fact, were found to have breast milk containing 500 times the quantity of DDT deemed safe by the World Health Organization.

"We saw this as a complex problem caused by the dependent socioeconomic conditions in which we live," Oscar explained, "The fruit exporting and so on. Because it's not easy to resolve we've formed a special commission to investigate the use of all insecticides, which recently presented its proposals for changes in legislation and regulation to the government." The special commission is part of..."
the National Commission on Integral Worker Health, which has representatives from the ministries of Labor, Health, and Industry; the National Institute of Agrarian Reform; the Association of Farmworkers; the Sandinista Workers' Confederation (the trade union organization); and the grassroots community groups. This National Commission has also recommended safety levels for physical agents such as heat, vibration, and noise, and chemical agents such as mercury and lead. In effect, it sets policy on occupational health and safety issues and ensures that workers are instrumental in shaping that policy.

"As you can imagine," said Oscar, "the pest problem in the hot tropical climate is a serious one. We've set up an experimental station to try and figure out what kind of biological controls can be used and what kind of pesticide alternatives are available.

"The Ministry of Health, for its part, has been training workers in the health centers close to areas where pesticides are used so that they will be familiar with signs of pesticide illnesses and their treatment. They are also going to institute a large program of cholinesterase screening to see how much people are being exposed to." Cholinesterase is an enzyme essential to central nervous system functioning. Its level is depressed, often seriously, by organophosphate compounds, such as parathion, malathion, diazinon, and other commonly used pesticides.

"The Ministry of Natural Resources is engaged in studies with the University to determine the exact extent of environmental contamination," Oscar said, "All of this has come out of work of the Commission. We think the new law will be enacted by next year. Meanwhile, on a day to day basis, we're continuing the education program so the workers will know what they're working with, and we make sure all the materials are being properly labelled, the equipment is properly designed, that sort of thing.

"The ideal would be to devote all our energy to health and safety, but we obviously cannot do that. There are intimate ties between occupational health and the political process. Health and safety started with the Revolution, and so to advance and consolidate the Revolution is to advance health and safety in Nicaragua, and vice versa. But the most important thing is to advance the Revolution, specifically to eliminate the counter-revolution." To many North American ears this might sound like a rhetorical "commercial," but Oscar said it with quiet conviction, as a statement of self-evident fact.

"Still," he concluded with obvious pride, "all our annual goals in health and safety have been met, and will continue to be met. One compañero who came to Nicaragua told me, 'You are doing more for health and safety in your country in a time of war than almost all countries do in a time of peace.' "
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\textit{Mail to: Health/PAC Bulletin, 17 Murray St., New York, NY 10007}
Bio Feedback

If you were impressed by the cover story in this issue, you may want to hear about the Committee for Responsible Genetics. At the September 29 press conference announcing its formation, Barry Commoner warned, "We are allowing a technology that was created by public investment to be distorted with respect to what it produces." Other members of the Board of Directors include Jonathan Beckwith, Eula Bingham, Ruth Hubbard, Tony Mazzochi, and Victor Sidel. The Executive Director is Terri Goldberg.

The Committee's goals include increasing public awareness of the use of genetic engineering to modify gene pools, the role of gene splicing in weapons development, and the neglected potential of biotechnology to improve the human condition.

For more information write RO. Box 759, Cambridge, MA 02238.

Engaging Aging

The National Institute on Aging, a section of the National Institutes of Health, is offering a series of its pamphlets free of charge. Titles include Medicine and Aging, Senility Reconsidered: Treatment Possibilities for Mental Impairment in the Elderly, and To Understand the Aging Process: The Baltimore Longitudinal Study of Aging.

For copies of these pamphlets or a complete publications list, write Information Office, Box OP, National Institute on Aging, Building 31, Room 5C35, Bethesda, MD 20205.

Uncle Sam's Bookstore

The Federal government has produced an enormous number of books, tapes, pamphlets, and other materials on health matters designed for health professionals. Now you can get an easy to use listing free. Staying Healthy: A Bibliography of Health Promotion Materials, is available from the National Health Information Clearinghouse to those who write and enclose a self-addressed mailing label.

The Clearinghouse has also prepared a series of free resource guides called Healthfinders, which have up to date information on specific topics such as herpes information resources and toll-free numbers for health information.

All of these materials can be obtained by writing Department AVM, National Health Information Clearinghouse, P.O. Box 1133, Washington, DC 20013-1133.

NHeLP is on the Way

The National Health Law Program has just published Birth Rights: An Advocate's Guide to Ending Infant Mortality, by Francie Hornstein and Judith G. Waxman. The guide was written primarily for legal services workers who wish to assist their clients in obtaining quality maternity care services, but NHeLP wishes to make it available to health professionals, women's health activists, and others "who can play a part in reducing the shamefully high infant death rates in this nation."

Contents include infant mortality statistics, major funding sources for public entitlement programs, potential of alternative providers of maternity care, and case studies of successful community based efforts to lower infant mortality rates among the poor and minorities.

Copies are $8 to cover printing and mailing. Write to National Health Law Program, 2639 S. La Cienega Boulevard, Los Angeles, CA 90034.

Toxic Shock Troops

"Taking Back Our Health: An Institute on Surviving the Toxics Threat to Minority Communities," is a conference sponsored by the Urban Environment Conference in New Orleans November 18-20.

The purpose of the conference is "to disseminate and trade skills, resources, and information; and plan strategies for protection." The advance registration fee is $60, which pays for meals as well.

For further information, call (202) 797-0446 or write Urban Environment Conference, 1314 14th Street, N.W., 3rd floor, Washington, DC 20005.

The Public Be Damned

Readers of William Shonick's article on private management of county hospitals in California in the...
Bulletin Board

Bulletin last year can get the full report now. UC Berkeley's Institute of Governmental Studies has just published *Public Hospitals Under Private Management: the California Experience*, by William Shonick and Ruth Roemer. Copies are $7.75 including postage. Checks should be made payable to the Regents of the University of California.

For further background, readers will want to purchase *Public Medicine in Crisis: Public Hospitals in California*, by E. Richard Brown ($4.25).

Both studies are available from IGS, 119 Moses Hall, University of California, Berkeley, CA 94720.

Warm Feelings

Parents of Premature and High Risk Infants International, Inc. is a new non-profit organization established to encourage support among parents of the nearly 300,000 infants annually who require intensive care. PPHRII, affiliated with the National Self-Help Clearinghouse at the CUNY Graduate Center, hopes to facilitate formation of and communication among local groups, establish a library of resource materials, and encourage communication between parents and perinatal professionals.

Annual individual membership is $15, which also brings a subscription to the group's quarterly, *Support Lines*. Checks should be made out to PPHRII and mailed to Maureen Lynch, Executive Director, Parents of Premature and High Risk Infants International, 33 West 42nd St., New York, NY 10036.

Shedding Light

*Closets are Health Hazards*, a slide presentation about gay and lesbian health care workers, is available from the American Medical Student Association, LGP!M Staff Liaison, 1910 Association Drive, Reston, VA 22091. The price is negotiable.

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by Tony Bale

When the current occupational safety and health movement burst on the scene in the early 1970s, much of its energy came from a stream of books graphically exposing workplace slaughter in America. Labor activists Ray Davidson and Frank Wallick, journalists Rachel Scott and Paul Brodeur, Naderites Joseph Page and Mary-Win O'Brien, all produced vivid books that got people mad and moving. Now the movement has come of age a bit and its concerns are well known. Enter the social scientists.

A new literature is emerging that's less dramatic in its presentation of the dangers faced by workers, but more probing in its analysis of issues and forces underlying occupational safety and health. This new literature combines radical perspectives from the social sciences, concrete historical and social analysis, and attention to developments in other parts of the world. It digs deeper into the intellectual ground opened up by the journalists and safety and health activists.

Much of the early literature simply noted that the pursuit of profits and safety and health were incompatible and then provided vivid examples of employer greed. The new goes deeper, identifying links between capitalist production in specific historical configurations and workplace injuries and illness. Fine, textured analysis of the role of law and the state are combined with political economy to trace how pressures on particular industries or firms lead to dangerous practices.

This analysis may help the occupational safety and health movement in the United States become more aware of what it's about, the forces underlying hazardous conditions, and possible new political directions.

Unfortunately, most of the best material remains deeply buried in academic journals and doctoral dissertations; this essay looks at five of the more notable books of the past few years.

At the heart of *Work Hazards and Industrial Conflict* is an elegantly detailed picture of the industrial carnage among Massachusetts textile workers around the turn of the century and the means employers and insurers used to limit their liability. Sociologist Carl Gersuny uses sources such as local hospital records and correspondence between insurers and manufacturers to reveal as well as anyone ever has this world of frequent accidents where employers would go to outlandish lengths to concoct legal defenses alleging the employee's own negligence contributed to the accident.

Textile companies commonly bought off doctors, coroners, and interpreters; workers had little hope of winning a lawsuit or getting a decent settlement. Gersuny dedicated the book to Bridget Linehan, a Chicopee machine operator "injured by a lever of the machine she operated when a loose nut caused the lever to slip." Injured through what she felt was no fault of her own, she wanted the company to pay her lost wages and expenses. A manager of the company wrote the insurer, "I can settle with her . . . by paying her time and Drs. bills . . . . Tried to beat her down, but she said she would not take a cent less."

Anyone wanting to know what accidents and compensation were like for workers before the enactment of the workers' compensation laws can find no more elegantly presented picture than Gersuny's book.

Following the textile material is a discussion of the subsequent legal environment of workers' compensation, collective bargaining, and the Occupational Safety and Health Administration. The elaborate legal process involved in an OSHA investigation of the death of a New Hampshire carding machine operator crushed in the rollers of his machine serves as a contrast to the earlier period.

Gersuny opens up the important discussion of the sources and forms of class conflict involved in occupational safety and health; unfortunately, he doesn't probe very deeply into it.

He regards the conflict of interest between workers and employers around safety and health as endemic, but gives no sense of the potentially explosive nature of these events on workers' consciousness. In fact, fatal accidents like the ones he describes may serve as a crystallization of
humane pace of work, refusals to work in hazardous situations, wildcat strikes, etc. Current movements against occupational diseases are not even mentioned.

Sociologist David P. McCaffrey, a former employee of the Bureau of Labor Statistics, has written a concise book on exactly what the title suggests, OSHA and the Politics of Health Regulation. His explicit aim is to use OSHA's regulatory activity—particularly standard setting on toxic chemicals—to shed light on several theories of the state. The pluralist view of the state as a battleground of interest groups explains the most, he argues; the efforts of the state regulatory bureaucracy to preserve its own power and routines explains much of the rest. Least appropriate to OSHA's activity, in McCaffrey's view, is the capitalist state thesis, which asserts that the state expresses the interests of the capitalist system as a whole, even against special-interest business groups.

His book provides a detailed, thoughtful analysis of OSHA's regulatory activity through 1980. Actually, what he achieves is less illumination of theories of the state using the OSHA regulatory experience than new light on OSHA's activity as seen through the conceptual prism of conflicting theories of the state.

He does dispel two myths: the rightwing myth that OSHA has been an aggressive regulator, and the leftwing myth that OSHA totally caved in to business pressure. The book documents the give and take of various actors in the regulatory process; it shows how interest group pressures, the nature of the Occupational Safety and Health Act itself, historical circumstances, and new demands placed on the agency by the courts set the irregular pace of regulation.

The result is a valuable first attempt to present and analyze the sweep of OSHA regulatory activity within a framework that encompasses concrete historical events and substantive social theories. Its depth and careful attention to facts is a distinct improvement on the usual two or three sentence throwaway remarks about how some activity of OSHA "proves" a particular point about the nature of the capitalist state.

Assault on the Worker is the best single-volume introduction to occupational safety and health for nonspecialists available. It combines the talents of a sociologist, a journalist, and a lawyer from Western Canada. Unlike the two books described above, it captures the contemporary reality of efforts of individuals and unions to win safety and health. Photographs and stories of injured workers make their problems real and haunting. They are complemented by concise information on hazards, labor struggles, and legislative matters.

Most of the examples are from a Western Canadian context not too different from the United States. Readers might find the Canadians have better workers' compensation systems and more active worker participation in safety and health matters; on the other hand, their regulatory apparatus seems weaker and accidents more frequent. The slight unfamiliarity of the Canadian context to American readers is more than balanced by the explicit political analysis and forceful presentation.

Some of the best new work on occupational safety and health has come from social scientists working in the area of crime and law. They are helping to unravel the ways in which legal practices embedded in workers' compensation and the regulatory process allow employers to get away with forms of murder. The title Assault on the Worker aptly describes the book's central image: workers are assaulted at the workplace; the consequences of this are smoothed over by the legal system; workers continue to struggle on an individual and collective basis to win a measure of justice. "Should the company which threatens the workers' safety and health for profit be less culpable when death occurs than the armed robber who threatens the workers' safety and health for profit? We think not," say the authors.

The International Journal of Health Services has been the best single source for new critical work on occupational safety and health. Health and Work Under Capitalism collects some of these pieces from 1977-1981.

It reflects the International Journal's interest in the relationship between work and health in the broadest sense as a producer of ill health, as well as for the narrower version of
that relationship conventionally understood under the term "occupational safety and health."

The anthology contains discussions of occupational safety and health in different countries: India, the United Kingdom, and the United States are treated historically; West Germany receives a more analytical look. The comparison most likely to raise American consciousness comes in the Assennato and Navarro discussion of how workers' control at the shop floor developed out of Italy's 1969 hot autumn; the International Journal is one of the few places where one can read about these astonishing events when grassroots workers' committees and homogeneous groups tried to take control of the shop floor, collect and evaluate data on workplace hazards, and even create a new model of occupational health science.

Some of the work included in the book has become well-known in occupational health circles—Dan Berman on the United States; Barry Castleman on asbestos proliferation; other pieces deserve to become as well-known—Barbara Ellen Smith on the social production of Black Lung; Vicente Navarro's continuing investigation of the relationship of work to health, science, and the production of capitalist social relations, and the forms of struggle to transcend those relations; and Cristina Laurell's wide-ranging use of a Marxist approach to work relations to analyze the "wearing out" of the population in Third World countries.

One regret is that the rhythms of publishing are such that by the time this valuable collection came out, a similar number of related articles of comparable quality had already appeared in the International Journal.

W.G. Carson is a Senior Lecturer in Criminology at the University of Edinburgh who has done valuable work on both the British Factory Acts of the nineteenth century and enforcement of contemporary British health and safety regulations. In The Other Price of Britain's Oil Carson has combined his own digging and the investigations of several official bodies with the perspectives of several social sciences to provide a concrete, detailed, and convincing picture of a safety and health disaster.

Accidents in North Sea oil exploration and development have been caused primarily by failure to observe routine, well-known safety measures—not because the multinational oil companies were operating on the "frontiers of technology," as the popular conception would have it. Carson presents the work operations involved exacting detail. He shows how particular serious accidents developed from lack of proper safety procedures, neglected in the drive for quick exploitation of Britain's oil. His narrative reveals how this "political economy of speed" evolved from links between the oil industry and the British economy, the multinationals and the regulators, and the "institutionalized tolerance" of mundane design faults and unsafe practices.

Carson's attention to Scottish law is tough going, but it is the detailed account of relations between political economy, the state, legal practices, and preventable injuries that makes this book so convincing and so much better than any other on the subject. Carson has gotten each step of the story, made it vivid, and drawn a complete causal and historical chain. The result is a book which conveys the full complexity of the causes of an occupational safety and health disaster better than any other work I know.

In his words:

At one level, of course, it may be that the industry's own penchant for getting on with things as quickly as possible—for its own sound economic reasons—may be a significant contributory factor in the generation of a high accident rate. More central to my thesis, however, is the argument that the commitment of successive Governments and Departments to the policy of speedy exploration and exploitation permitted a situation to arise in which operations ran on ahead without adequate legislative provision for their safety. Even when such provision was made, the focus on speed still meant that the pace of offshore developments continued to outstrip the formulation of the necessary subordinate regulations. The preoccupation with haste also permeated the practice of enforcement, contributed to the maintenance of a 'privatized' relationship between controllers and controlled, and became one of the main bones of contention in the internecine wrangling which came to surround the administration of offshore safety in the second half of the 1970s. Not least, the urgency with which the objective of getting Britain's oil ashore was pursued left a stream of legislative and organization chaos in its wake and thus further hampered the establishment of effective controls.

Carson makes a fundamental contribution to the study of production pressures at the industrial and shop-floor levels as fundamental determinants; he shows how such pressures also effect the structure and operations of the regulatory apparatus.

Analogies with gung-ho industries "regulated" by captive agencies in the United States spring to mind—most notably the nuclear power industry. Our own offshore drilling also merits scrutiny.

It's turned out that the frontiers of science and technology have produced less dangers to the public and workers than faulty gauges, shoddy welding, dropped wrenches, and the like. High pressure to get the nuclear plants on line lead to adopting faulty designs and, abetted by shoddy regulation, has produced a potential disaster for all of us.

These five books constitute some of the best new work in the field. Taken together, they show a deepening interest in the wide-ranging connections between work and health; in exploring the forms of class struggle involved in occupational safety and health; in decoding the ideological forms embedded in legal theories and practices; in connecting analysis of safety and health with the vigorous
peoples' understanding of oppressive work relations and lead to spontaneous outrage. Similarly there is no reference in the book to the constant workplace efforts to maintain a debates on the nature of the capitalist state. The social scientists among them have gone beyond generalizations about connections between occupational health and safety and capitalist economic imperatives; they use historical and social analysis to specify linkages between the various elements involved.

This new work provides access to European analysis more complex than American leftists are accustomed to. It offers the American occupational health movement an opportunity to break out of its intellectual and national parochialism and do what radical analysis does best: get to the heart of the matter so radical surgery becomes possible.

continued from page 4 and films that show elementary medical processes, and the instructor provides commentary before and after. Our orientation is practical in both the three month training and in our weekly visits. These visits are also important to encourage the worker and to give the community the sense that we are involved so it will have more confidence in the health worker.

If there is an emergency, say a case of acute appendicitis, the patient is brought to the health station, which usually is no more than about ten kilometers away. If, for example, someone has a kidney stone, the health worker will give anti-spasmodics. If that doesn’t work after two or three tries, the patient will go to the health station, at which there are two people. One is the medical assistant, who takes care of security, and the other is the health assistant, who takes care of health and preventive medicine. The health station is responsible for five or six villages, which usually means about 20,000 people. And then there is the health center, which could be considered a very small hospital. One type is the mobile care hospital (MCH), another is the polyclinic, and the third is the mobile clinic. The MCH has between 15 and 20 people and a laboratory, and can admit between five and ten patients. It can handle diseases which aren’t very severe, such as malaria, pneumonia, renal stones. Above this there are ten or twelve regional hospitals, depending on the military situation; we have one big central hospital which has a capacity of about 1200 patients.

About 35 percent of the local health workers are women. We have about 100 nurses in all, of which 80 or so are women; one of our 22 doctors is a woman.

Generally the health services aren’t overwhelmed because of the pyramidal structure, which sends only the serious cases outside the village—most of the problems are the standard ones: diarrhea, malaria, schistosomiasis, stones.

We do have patient lines on the local level and try to shift personnel around to meet needs. Moreover about 30 percent of the population is nomadic, so we have to provide mobile clinics for them as we do for the third of the population in militarily contested areas.

When the health workers are brought a child whose basic problem is obviously malnutrition, it’s a very painful situation. The health worker has to explain this to the parents, and of course the immediate question is “Where can we get food?” We try to give them information on which foods are most vital—generally the child needs more protein—and we give what we can through our relief organization.

Children get priority in food distribution. We don’t believe the problem of malnutrition can be solved in the clinics and hospitals. We believe it has to be attacked at its roots by the departments of Agriculture and Relief. We try to get millet from the Sudan—it’s the main source of carbohydrates; vegetable oil, which is the main source of fat; and sometimes butter from Europe; and we also try to distribute chickpeas and lentils for protein.

This is the cheapest more or less balanced diet. Of course it’s lacking in some vitamins and minerals as well as fruits, but it will enable people to survive—and to see the benefits of a balanced diet. The drugs we supply to the village health stations are mostly vitamins, antibiotics, drugs for intestinal infections, and painkillers. We’ve been trying to explore herbal medicines, but because of the conditions we haven’t gotten very far; we have done some work with skin infections. We’ve gotten a pill-making machine and can make them from powders we import for about a dozen of the most widely used pills. Obviously our resources are quite modest.

People who would like to help can send donations to Eritrean Medical Association, P.O. Box 421, Radio City Station, New York, N.Y. 10011.

Nerko Tekle Michael, M.D.
Eritrean Public Health Coordinator

continued from page 6 on the picket line, but it wasn’t long enough for victory. Their efforts did win national attention, particularly among nurses and other healthcare workers and, in the words of a California Nurses Association commendation, “the knowledge and experience gained by these nurses can be used to facilitate positive outcomes of future collective bargaining.”

“Proud to Be a Staff Nurse”

A powerful grassroots insurgency in Seattle, WA has culminated in a vote by 1200 registered nurses at the Group Health Cooperative to affiliate with the National Union of Hospital and Health Care Employees – District 1199. Increasingly dissatisfied with the Washington State Nurses Associa-
tion, the RN's—including five WSNA officers who resigned their elected positions—formed their own unit last January. This Group Health Registered Nurses Union voted a few months later to decertify WSNA and affiliate with 1199.

Propelled by the momentum generated in this switchover, the nurses won a contract by August that secured protection from "floats" to unfamiliar units. The reverberations of the successful 1199 campaign, waged under the banner "Proud to be a staff nurse," will be felt across the country. Rank and file participation was exceptionally high, the Group Health Cooperative nurses unit is quite large, the WSNA had represented the RN's there for 23 years, and Washington State is the home base of the President of the American Nurses Association.

They'd Rather Fight and Switch

District 1199 won several more victories in Michigan. After a bitter 54-day strike against Bay Medical Center in Bay City, MI—"The J.P. Stevens of the healthcare industry," according to one nurse who works there—licensed practical nurses and registered nurses wrested a decent contract from management.

The LPN's were 1199 members. The 300 RN's had decertified the Michigan Nurses Association and formed their own union two years ago, but they were so impressed by their success in coalition with the LPN's in the face of tough management tactics that they have affiliated with 1199 as well.

CENTRAL AMERICA
ON THE EDGE OF DISASTER

A New Vietnam.
President Reagan, at his July 26 news conference, said, "First of all, there is no comparison with Vietnam and there's not going to be anything of that kind in this."

Unfortunately, there already is. Like Vietnam, Central America has a long history of economic and political repression going back to colonial times. "Outside forces," whether China or Cuba, are not the cause of the upheavals in either of these regions. Like Vietnam, unpopular regimes are backed by US money, arms, and military advisers, one of whom has already been killed in El Salvador. Now thousands of US combat soldiers are committed to maneuvers in Honduras, and a fleet of twenty ships is stationed off both coasts of Nicaragua. Will there be a new Tonkin Gulf incident, like the one that deceived Congress in 1964?

Americans have memories, and they know a disaster when they see one. We are on the verge of another war... and the time has come to stop it.

A President Out of Control. By large majorities the American people have made it clear they do not want US military involvement in Central America. But a divided Congress has failed to stop an administration bent on the worst kind of "gunboat diplomacy."

Don't let Congress fail again. Tell your Senators and Representative they must cut off all funds for military aid, overt or covert, in the whole region. They will be home for recess this month; go see them. Tell them the administration must be brought under control.

... The Coalition for a New Foreign and Military Policy represents millions of Americans who want to reassert popular control over a reckless and inhumane foreign policy. The Congressional Quarterly last year called the Coalition "the nerve-
center of citizen pressure on Congress" to change Central American policy. For five years the Coalition has coordinated virtually all constituency work on Central America and built up a network of thousands nationwide.

Our fifty-one member organizations include ten Protestant denominations, five Catholic groups, three Jewish groups, the National Council of Churches, several ecumenical organizations, ADA, SANE, US Student Association, YWCA, and several other human rights and peace groups.

To stop this war we need your help. Join our network and send us whatever contribution you can afford. We will keep you posted about all key events in Congress and Central America itself. Your dollars are needed urgently at this crucial moment.

COALITION
For a New Foreign and Military Policy

Stop the War. Send Your Message Today.

Dear __________:

I urge you to oppose all further U.S. military aid, exercises, and covert action in Central America. I urge you to press the administration to suspend current military support and actively engage in unconditional negotiations to bring lasting peace and justice to Central America. We can no longer support governments at war with their own people. Please stop this dangerous spiral of intervention.

Your Representative
U.S. House of Representatives
Washington, D.C. 20515

Your Senator
U.S. Senate
Washington, D.C. 20510

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