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SCIENCE FOR THE PEOPLE

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ASSESSING RISK

LANGDON WINNER
Risk is a new name for hazards

JOSEPH REGNA
Making toxics acceptable

ASBESTOS FOR SALE

Preview

A nuclear risk turned into real disaster when a Soviet nuclear reactor melted down at a nuclear complex in Chernobyl on April 28. Days later, the world was still speculating about the extent of injury, death, damage, and radiation contamination.

Media accounts and expert opinions differed widely, with little first-hand reporting of the nuclear explosion. The Soviet government said that only two people had died, 197 were hospitalized, and thousands evacuated from the surrounding area. They asked the West German and Swedish governments for help in putting out a fire in one reactor that was apparently spreading to another nuclear reactor at the site. But a UPI story quoted a resident of Kiev, a city of 2.4 million people 60 miles north of the disaster, as saying, "Eighty people died immediately, and some 2,000 people died on the way to hospitals. The whole October Hospital in Kiev is packed with people who suffer from radiation sickness." It sounds as though a nuclear bomb had exploded.

The secrecy about the extent and effects of the meltdown is an international tragedy. Without hard information and assistance, the lives of those living in the area near the plant, the environment, food chain, and even other countries affected by the radioactive plume are placed in further jeopardy. This cold war response to an accident of such magnitude imperils our ability to react globally to environmental disasters spawned by technologies like nuclear power. Nuclear power plants operate in 26 countries. A meltdown or accident so immense has no national boundaries. In fact, news of the disaster first reached the west when Finland, Denmark, and Sweden reported atmospheric radiaton levels ten times above normal.

U.S. and European scientists have estimated about 3,000 deaths in the first weeks, caused by the explosion, fire, and radiation sickness if radiation exposure exceeded 500 rads. Fatalities could be five times higher from radiation-induced injuries in the following weeks. And thousands of people could develop cancer and other serious illnesses years from now as a result of radiation exposure from this accident.

In this issue of Science for the People, we look at risk and health hazards from many perspectives. The apparent nuclear meltdown at the Chernobyl power plant makes the need for an examination of risk analysis even more acute. In his opinion piece, Jon Beckwith asks progressive scientists to analyze and debate their attitudes toward new technologies, and questions whether nuclear power is always dangerous, or if it can be controlled and used positively in some societies, such as Cuba. We now know it isn't a safe technology in at least one communist country.

The Soviet disaster illustrates the urgent need for responses to new technologies. In the case of nuclear power, a meltdown is no longer a risk. The real name for this nuclear risk is disaster.

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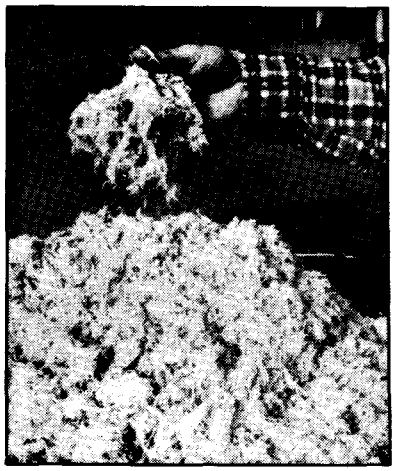

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Newsnotes

Sterilized Housing

In SftP's 100th issue (July/August 1985) we ran a Newsnote on a eugenics program in Singapore. Prime Minister Lee Kuan Yew initiated the project because of his concern about the declining "intelligence stock" and "quality of human material" in Singapore.

The plan included a computer dating service, love boat cruises, and other mating and childbearing incentives aimed at women with degrees in higher education. It was cancelled due to lack of success, rather than feminist and anti-eugenic enlightenment.

But the program to discourage childbearing, aimed at poorly educated and low-income women, has operated successfully since it began in June 1984. Women who agree to be sterilized are rewarded with a $4,000 down payment for a government-sponsored, low-cost apartment. They must be under 30 years old, have no more than two children, no education beyond junior high school, and earn a maximum of $300 a month.

Financial incentives have been used before to eliminate people considered to be socially undesirable. Rewarded with vacations or sterilization and low-income housing, in this eugenics program, women lose whether they have children or not.

—*Information from International Journal of Health Services*

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Trashing Unearthly Economics

Andrew Joslin

Like the Earth, nearby outer space is now polluted by manmade trash. About 5,000 discarded objects, including obsolete satellites, fragments from satellite explosions, old booster rockets, lost equipment and garbage jettisoned from spacecraft, are being tracked in orbit around the Earth.

An estimated 40,000 objects the size of a marble, left over from experiments, space explosions, and anti-satellite tests, spin around the Earth at dizzying speeds over 17,500 miles per hour. Between 10 and 100 billion paint flakes and other tiny objects orbit with the larger debris, increasing the chance of space accidents and inadvertent nuclear explosions. Some unexplained satellite failures may have been caused by collisions with space garbage.

According to *Science Magazine*, a collision with a .5 mm metal chip could puncture a space suit, and an object 1 to 5 mm in diameter could render a satellite inoperable for both "manned" and "unmanned" space exploitation and exploration.

The amount of space trash nearer the Earth is also growing. And fallen nuclear reactors from Soviet satellites and plutonium dust from failed U.S. nuclear spacecraft have added radioactive atmospheric contamination to the problem.

According to NASA astrophysicist Donald Kessler, the number of sizeable pieces of space junk is growing at a rate of 300 to 500 objects per year. Some experts believe that the growth may become exponential, which would quickly make travel from Earth into space impossible.

Joel Scheraga writes in *Technology Review* that the solution to this problem is to establish property rights in outer space. According to Scheraga, "because no one owns locations in space, the cost to any nation or commercial user of occupying and polluting a section of space is zero. Assigning property rights to countries would make them responsible for any debris in their sections of space."

Scheraga's unbridled belief that private ownership would eliminate pollution in space cannot possibly be

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NRC Deceives Itself

A company hired by the Nuclear Regulatory Commission to train nuclear power plant workers taught trainees how to hoodwink the NRC. General Physics Corporation of Columbia, MD told nuclear workers that "springing changes" on the NRC "has the benefit of surprise." Workers were also advised to keep mum about failed equipment tests and not tell government inspectors, since "some smooth talkers have managed to get out of failures."

If that doesn't make you feel secure enough about the training the U.S. government sponsors for nuclear plant workers, maybe this advice will. When testing equipment in front of an NRC inspector, General Physics warned: "Don't be foolish. Note: perform demo on an 'easy' valve which has traditionally NOT been a problem leaker."

In response, the NRC reprimanded General Physics for "unacceptable" conduct, and ordered the retraining of workers who participated in their courses in deception during 1983 and 1984. That was the extent of the NRC's discipline. Two other training contracts with the NRC were allowed to continue after the government learned of the company's fraud.

"It certainly is questionable whether any contractor that advises nuclear utilities on how to put one over on the federal government should also have the privilege of receiving taxpayers' money," Massachusetts Rep. Edward Markey of the House subcommittee on energy wrote to the NRC.

The first General Physics course discovered to be deceitful taught workers how to test for leaks in the buildings that surround nuclear power plants, and was given to employees of General Public Utilities Nuclear Corporation. That firm was then under indictment on 11 counts of falsifying information about radiation leakage at its Three Mile Island plant.

The NRC hired a fraudulent firm to train employees of a nuclear company that was convicted of criminal deception and responsible for the worst nuclear power plant accident in the U.S. Now *that's* incredible! *—information from the Washington Post*

Correction

The lead to Ruth Hubbard's article, "Facts and Feminism" (March/April 1986), should have read: "The Brazilian educator Paulo Freire has pointed out that people who want to understand the role of politics in shaping education must "see the reasons behind facts." The word "the" was mistakenly inserted before "facts" in the quotation.

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based upon experience, since private ownership on Earth has had no such salutary effects. Not only would Sheraga's plan reproduce in space the inequities which already exist on Earth, but it would fail to solve the problem.

The completely different environment in space makes it unclear how private property could be applied. Would "real estate" consist of cones of space emanating from points on the Earth, shells at a given radius from the Earth, or random plots? Would the locations of such plots be fixed with respect to the Earth—thus appearing motionless to an earthly observer—or with respect to the sun, appearing to move as the Earth revolved in its orbit? Would a space plot have to be rented for the few seconds it took a rocket to pass through, or would there be rights of way? What if opponents of space travel or—God forbid—the Soviet Union bought a thin spherical shell of space around the Earth and refused to allow trespassers to pass through it?

Perhaps these problems could be solved by legions of economists, but what is the point? The real cause of space trash is not the practices of ownership, but our attitude toward nature in general and space in particular. As long as space, like the Earth, is recklessly abused, it will be soiled and eventually destroyed and rendered useless.

Project West Ford, an experiment in which the military launched 400 million copper needles into an orbit 2,300 miles high in order to enhance the natural reflection of short wave radio signals, is a case in point. In spite of international criticism, after a first attempt failed in 1961, the U.S. performed a second successful experiment in 1963, leaving debris which may still be in orbit.

More recently, on Sept. 13, 1986, the U.S. tested a new generation of space weapons by destroying an old Air Force satellite with a missile, creating 100 pieces of space junk. The Soviet Union has been blowing up its outmoded satellites for years, creating tons of orbiting debris. Both superpowers would rather destroy their old satellites and keep the remains in space than let them re-enter the atmosphere, where they could be recovered by the other side.

Since the Department of Defense probably will be the biggest U.S. user of space, it will be the largest generator of space trash as well. Accordingly, the most effective solution to the space trash problem might be to deny or severely limit the military's access to space. The remaining space missions could be screened by a newly-created international organization regulating space travel. They could use environmental impact assessments to determine the impact of future space missions on the space environment.

Not until thoughtful consideration replaces uncontrolled exploitation can the rape of the Earth be prevented in space. The creation of property rights in space is no solution. *—Dan Grossman*

Newsnotes

Canada's Peaceful Revolver

In these times, as the aerospace industry is chirping happily about its soon-to-emerge brood of satellite contracts, a peaceful orbiter is a rare bird indeed. A recent issue of *INPUT/OUTPUT* focused on Star Wars, accidental war, and computer systems. One article described a proposed Canadian "peace satellite". The newsletter is published by a Canadian organization of scientists, computer professionals, and engineers opposed to the military use of their work, called Initiative for the Peaceful Use of Technology (INPUT).

The satellite they describe, once sent into orbit, would supposedly ferret out and sneak up on various types of Star Wars hardware sent up by the superpowers. It would use optical, radar, electromagnetic, and infrared sensors, as well as chemical analyzers to examine the object under suspicion. Then this space espionage robot would transmit the information back to a station on Earth. There it would be used by a yet-to-be-conceived third party, which would discern what sort of weapons capability the other satellite had.

Paxsat "A," as the device was dubbed, was conceived as one element in a network of remote-sensor devices designed for this purpose. Last year, a Toronto-based company named SPAR Aerospace submitted a technical feasibility study to the Canadian Government Arms Control and Disarmament Agency. This and a follow-up study by SPAR now sit waiting on bureaucratic desks in the External Affairs Division. The project seems to have lost its initial appeal in the press, too. What seems to have been the problem?

A spokesman for the Canadian government admitted to SftP that the Paxsat idea was "not really for today's world." He agreed with INPUT that the largest hurdle is that the project would prove politically unfeasible in the present climate of discord on the most basic elements of arms control. Regardless of whether the system actually worked or not, the project "envisions a treaty limiting or banning weapons in space," which, of course, doesn't exist yet.

For many months now, the official policy of Canada's conservative government toward Star Wars has been to support in principle the objectives of the Reagan Administration. SPAR, like nearly all other aerospace outfits, has plenty of interests in less peaceful defense work as well. They have done weapons-related work for the Navy, as well as contracted for the highly militarized space shuttle program.

It seems that Paxsat, however pleasant sounding, actually serves to legitimize and make more palatable the sour idea of an arms race extended to space. Moreover, when responsibility for disarmament, or even arms control, is entrusted to companies or governments in support of SDI, the contradictions manifest themselves in more new military hardware and software.

—Luigi Palmeri

Canaries at Carbide

In April, the Department of Labor's Occupational Safety and Health Administration fined Union Carbide $1.37 million for "willful disregard for health and safety." They cited 221 safety violations at Carbide's Institute, West Virginia plant which bore strong resemblance to the conditions leading to the chemical disaster at Institute's sister plant in Bhopal, India.

OSHA began an investigation of the West Virginia plant last September, after a leak of aldicarb oxime sent six workers and over 130 local residents to the hospital. OSHA charged that Carbide intentionally underreported the number of workers' injuries at the plant, maintained defective safety equipment that increased the threat of fire, explosions, and worker exposure to toxic chemicals, and failed to install monitoring devices for dangerous chemical leaks at the plant.

The worst finding was that Carbide used one worker on each shift as a "sniffer" for deadly phosgene gas leaks. "They used to use canaries for that," said Secretary of Labor William Brock.

Poison Ivy League

What do Yale, Cornell, the University of Pennsylvania, and Columbia all have in common? They are all ivy league colleges, but they also have the distinction of being on a selective list released by the Department of Defense. Along with over 100 other contractors, they're conducting chemical warfare research.

The list contains the name of the principle investigator, the contract number, the starting date of the project, and a one-line description of the research. A "computational model and field study of wind through and over forest edges" and "**detoxification of acetylcholinesterase inhibitors [nerve gas]**" are among the research projects being conducted at private and public institutions across the country.

There may be someone perfecting chemical warfare techniques in the laboratory next to yours. If you would like a copy of this list, send a stamped, self-addressed envelope with a check for $2 to Science for the People, attention University Chemical Warfare Research Program. As a service to the community, we'll look up a specific institution and let you know whether it's on the list, free of charge. It's your right to know.

—Dan Grossman

RISK

Another Name for Danger

Every time you make a move, you take a risk.
Monty Hall
Host, "Let's Make a Deal"

by Langdon Winner

The most prevalent way our society explores the possibility of limiting technology is through the study of "risk." Noting how the broader effects of industrial production can damage environmental quality and endanger public health and safety, risk assessment seeks to perfect methods of evaluation that are at once rigorous and morally sound. This approach appears to offer policy makers a way to act upon the best scientific information to protect society from harm. Indeed, if we define "risk" as everything that could conceivably go wrong with the use of science and technology—a definition that many are evidently prepared to accept—then it seems possible that we might arrive at a general understanding of norms to

Craig Comeau

"If you picked Door Number 1, you would have won your very own suburban dream house!!"

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guide the moral aspects of scientific and technical practice.

But the promise of risk assessment is difficult to realize. The arena in which discussions of risk take place is highly politicized and contentious. Specific questions such as those dealing with the safety of nuclear power, as well as more general ones having to do with choosing proper methodologies for studying risks at all, involve high stakes.

Powerful social and economic interests are invested in attempts to answer the question, How safe is safe enough? Expert witnesses on different sides of such issues are often best identified not by what they know, but rather by whom they represent. Indeed, the very introduction of "risk" as a common way of defining policy issues is itself far from a neutral issue.

At a time in which modern societies are beginning to respond to a wide range of complaints about possible damage various industrial practices have on the environment and public health, the introduction of self-conscious risk assessment adds a distinctly conservative influence. By the term "conservative" here I mean simply a point of view that tends to favor the status quo. Although many of those who have become involved in risk assessment are not conservative in a political sense, it seems to me that the ultimate consequence of this new approach will be to delay, complicate, and befuddle issues in a way that will sustain an industrial status quo relatively free of socially enforced limits. It is the character of this conservatism that I want to explore here.

Risk and Fortitude

If we declare ourselves to be identifying, studying, and remedying hazards, our orientation to the problem is clear. Two assumptions, in particular, appear beyond serious question. First, we can assume that given adequate evidence, the hazards to health and safety are fairly easily demonstrated.

Second, when hazards of this kind are revealed, all reasonable people usually can readily agree on what to do about them. Thus, if we notice that a deep, open pit stands along a path where children walk to school, it seems wise to insist that the responsible party, be it a private person or public agency, either fill the pit or put a fence around it. Similarly, if we have good reason to believe that an industrial polluter is endangering our health or harming the quality of the land, air, or water around us, it seems reasonable to insist that the pollution cease or be strongly curtailed.

It seems to me that the ultimate consequence of this new approach will be to delay, complicate, and befuddle issues in a way that will sustain an industrial status quo relatively free of socially enforced limits.

Straightforward notions of this kind, it seems to me, lie at the base of a good many social movements concerned with environmental issues, consumer protection, and the control of modern technology. In their own way, of course, such movements are capable of adding elements of complication to policy discussion, for example, notions of complexity from ecological theory. Typically, however, these complications are ones that ultimately reinforce a basic viewpoint that sees "dangers" to human health, other species, and the environment as grave matters that are fairly easy to understand and require urgent remedies.

If, on the other hand, we declare that we are interested in assessing risks, complications of a different sort immediately enter in. Our task now becomes that of studying, weighing, comparing and judging circumstances about which no simple consensus is available.

Both of the common sense assumptions upon which the concern for "hazards" and "dangers" rely are abruptly suspended. Confidence in how much we know and what ought to be done about it vanishes in favor of an excruciatingly detailed inquiry with dozens (if not hundreds) of fascinating dimensions. A new set of challenges presents itself to the scientific and philosophical intellect. Action tends to be postponed indefinitely.

As one shifts the conception of an issue from that of hazard/danger/threat to that of "risk," a number of changes tend to occur in the way one treats that issue. What otherwise might be seen as a fairly obvious link between cause and effect, for example, air pollution and cancer, now becomes something fraught with uncertainty.

What is the relative size of that "risk," the "chance of harm"? And what is the magnitude of the harm when it does take place? What methods are suited to measuring and analyzing these matters in a suitable and rigorous way? Because these are questions that involve scientific knowledge and its present limits, the risk assessor is constrained to acknowledge what are often highly uncertain findings of the best available research.

For example, one must say in all honesty, "We don't know the relationship between this chemical and the harm it may possibly cause." Thus, the norms that regulate the acceptance or rejection of the findings of scientific research become, in effect, moral norms governing judgments about harm and responsibility. A very high premium is placed on not being wrong. Evidence that "the experts disagree" adds further perplexity and a need to be careful before drawing conclusions.

The need to distinguish "facts" from "values" takes on paramount importance. Faced with uncertainty about what is known concerning a particular risk, prudence becomes not a matter of acting effectively to remedy a suspected source of injury, but of waiting for better research findings.[1]

An illustration of this cast of mind can be seen in a study for the Environmental Protection Agency to determine whether or not there were indications that residents of the Love Canal area of New York, an abandoned chemical waste disposal site, showed chromosome damage. The report written by Dante Picciano, a geneticist employed by the Biogenics Corporation of Houston, Texas, drew the following conclusions: "It appears that the chemical exposures at Love Canal may be responsible for much of the apparent increase in the observed cytogenetic aberrations and that the residents are at an increased risk of neoplastic disease, of having spontaneous abortions, and of having children with birth

defects. However, in absence of a contemporary control population, prudence must be exerted in the interpretation of such results."[2]

Although the chemicals themselves may have been disposed of in reckless fashion, scientific studies on the consequences must be done with scrupulous care. Insofar as law and public policy heed the existing state of scientific knowledge about particular risks, the same variety of caution appears in those domains as well.

Frequently augmenting these uncertainties about cause and effect are the risk assessor's calculations on costs and benefits. To seek practical remedies for man-made risks to health, safety, or environmental quality typically requires an expenditure of public or private money. How much is it reasonable to spend in order to reduce a particular risk? Is the cost warranted as compared to the benefit received?

Even if one is able to set aside troubling issues about equity and "who pays," risk/cost/benefit calculations offer, by their very nature, additional reasons for being hesitant about proposing practical remedies at all. Because it's going to cost us, we must ponder the matter as a budget item. Our budgets, of course, include a wide range of expenditures for things we need, desire, or simply cannot avoid. Informed about how the cost of reducing environmental risks is likely to affect consumer prices, taxes, industrial productivity, and the like, the desire to act decisively with respect to any particular risk has to be weighed against other economic priorities.[3]

A willingness to balance relative costs and benefits is inherent in the very adoption of the concept of "risk" to describe one's situation. In ordinary use the word implies "chance of harm" from the standpoint of one who has weighed that harm against possible gain. What does one do with a risk? Sometimes one decides to *take it*. What, by comparison, does one do with a hazard? Usually one seeks to avoid it or eliminate it.

The use of the concept of "risk" in business dealings, sports, and gambling reveals how closely it is linked to the sense of voluntary undertakings. An investor risks his capital in the hope of making a financial gain. A football team in a close game takes a risk when it decides to run on fourth down and a yard to go. A gambler at a Las Vegas blackjack table risks his or her money on the chance of a big payoff.

In contrast to the concepts of "danger," "hazard," or "peril," the notion of "risk" tends to imply that the chance of harm in question is accepted willingly in the expectation of gain. This connotation makes the distinction between voluntary and involuntary risks outlined in some of the recent literature largely misleading. The word carries a certain baggage, a set of ready associations. The most important of these is the simple recognition that all of us take risks of one kind or another frequently.

Noticing that everyday life is filled with risky situations of various kinds, contemporary risk assessment has focused on a set of psychological complications that further compound the difficulties offered by scientific uncertainty and the calculations of risk/cost/benefit analysis. Do people accurately assess the risks they actually face? How well are they able to compare and evaluate such risks? And why do they decide to focus upon some risks rather than others?

A good deal of interesting and valid psychological research has been devoted to answering such questions. By and large, these studies tend to show that people have a fairly fuzzy comprehension of the relative chance of harm involved in their everyday activities.[4] If one adds to such findings the statistical comparisons of injuries and fatalities suffered in different situations in modern life, then the question of why people become worried about certain kinds of risks and not others becomes genuinely puzzling.[5]

The rhetorical possibilities of this puzzle are often seized upon by writers who assert that people's confusion about risks discredits the claims of those who focus upon the chance of harm from some particular source. Why should a person who drives an automobile, a notorious cause of injury and death, be worried about nuclear power or the level of air pollution? Invidious comparisons of this kind are sometimes employed to show that people's fears about

Craig Comeau

"Had you picked Door Number 2, you would have won a year's supply of these terrific house and garden products!"

technological hazards are completely irrational.

Hence, one leading proponent of this view argues, "it is not surprising that people with psychological and social problems are unsettled by technological advance. The fears range from the dread of elevators in tall buildings to apprehension about 'radiation' from smoke detectors. Invariably, these fears are evidence of displacing of inner anxiety that psychiatrists label as phobic." The same writer explains that normal folk are able to overcome such phobias by reminding themselves of the incalculable good that modern technologies have brought to all of us. "People of sound mind accept the negligible risk and minor inconvenience that often go hand in hand with wondrous material benefits."[6]

Once one has concluded that reports about technological risks are phobia-based, the interesting task becomes that of explaining why people have such fears at all. Tackling this intellectual challenge, anthropologist Mary Douglas and political scientist Aaron Wildavsky have developed a style of analysis based on the assumption that complaints about risk are not to be taken at face value. In their view all reports about environmental risks must be carefully interpreted to reveal the underlying social norms and institutional attachments of those making the complaints.

Different kinds of institutions respond to risk in very different ways. For example, entrepreneurs accept many kinds of economic risk without question. They embrace the invigorating uncertainties of the market, the institutional context that gives their activities meaning. In contrast, public-interest organizations of the environmental movement, organizations that Douglas and Wildavsky describe as "sects," show, in their view, obsessive anxiety about technological risks; the discovery of these risks provides a source of personal commitment and social solidarity the "sects" so desperately need.

Are there any environmental dangers in the world that all reasonable people, regardless of institutional attachment, ought to take seriously? Douglas and Wildavsky find that question impossible to answer. The fact that "the scientists disagree" requires us to be ever skeptical about any claims about particular risks. Instead, Douglas and Wildavsky offer the consolations of social scientific methodology to help us explain (and feel superior to) the strange behavior of our benighted contemporaries.[7]

Entering thickets of scientific uncertainty, wending our way through labyrinths of risk/cost/benefit analysis, balancing skillfully along the fact/value gap, stopping to gaze upon the colorful befuddlement of mass psychology, we finally arrive at an unhappy destination—the realm of invidious comparison and social scorn. This drift in some scholarly writings on risk assessment finds its complement in the public statements and advocacy advertising of corporations in the oil, chemical, and electric power industries.

Entering thickets of scientific uncertainty, wending our way through labyrinths of risk/cost/benefit analysis, balancing skillfully along the fact/value gap, we finally arrive at an unhappy destination.

In the late 1970s the debunking of claims of environmental hazards became a major part of corporate ideology. Closely connected to demands for deregulation and the relaxing of governmental measures to control air pollution, occupational safety and health, and the like, the "risk" theme in the pronouncements of industrial firms assumed major importance.

A typical advertisement from Mobil Oil's "Observations" series illustrates the way in which popularized risk psychology and risk/cost/benefit analysis can work in harmony. "Risky business," the ad announces. "Lawn mowers...vacuum cleaners... bathtubs...stairs...all part of everyday life and all hazardous to your health. The Consumer Product Safety Commission says these household necessities caused almost a million accidents last year, yet most people accept the potential risks because of the proven benefits.... Risk, in other words, is part of life. Fool's goal. Nothing's safe all the time, yet there are still calls for a "risk-free society.'"

Although I have read large portions of the recent literature on energy, environment, consumer protection, and the like, I cannot recall having seen even one instance of a demand for a "risk-free" society. The notion appears only as a straw man in advocacy ads like this one. Its text goes on to evoke a string of psychological associations linked to the experience of "risk" in economic enterprise. "Cold feet. What America does need are more companies willing to take business risks, especially on energy, where the risks are high.... We're gamblers.... Taking risks: it's the best way to keep America rolling...and growing."[8] Poker anyone?

There is, then, a deep-seated tendency in our culture to appreciate risk-taking in economic activity as a badge of courage. Putting one's money, skill, and reputation on the line in a new venture identifies that person as someone of high moral character. On the other hand, people who have qualms about the occasional side effects of economic wheeling and dealing can easily be portrayed as cowardly and weak-spirited, namby-pambies just not up to the rigors of the marketplace.

Public policies that recognize such qualms can be dismissed as signs that the society lacks fortitude or that the citizenry has grown decadent. Thus, in addition to other difficulties that await those who try to introduce "risk" as a topic for serious political discussion, there is a strong willingness in our culture to embrace risk-taking as one of the warrior virtues. Those who do not possess this virtue should, it would seem, please not stand in the way of those who do.

Avoiding "Risk"

By calling attention to these features in contemporary discussions about risk, I do not want to suggest, as some have done, that the whole field of study has somehow been corrupted by the influence of selfish economic interests.[9] Neither am I arguing that all or most conversations on this topic show a deliberate, regressive political intent. Indeed, many participants have entered the debate with the most noble of

scientific, philosophical, and social goals.

Much of the analytically solid writing now produced on this topic seeks to strengthen intellectual armaments used to defend those parts of society and the environment most likely to experience harm from a variety of technological side effects.[10] And certainly there are many fascinating issues under the rubric of risk assessment that are well worth pursuing. I can only join in wishing that such clearheaded, magnanimous work flourish.

But from the point of view I've described here, the risk debate is one that certain kinds of social interests can expect to lose by the very act of entering. In our times, under most circumstances in which the matter is likely to come up, deliberations about risk are bound to have a strongly conservative drift. The conservatism to which I refer is one that upholds the status quo of production and consumption in our industrial, market-oriented society, a status quo supported by a long history of economic development in which countless new technological applications were introduced with scant regard to the possibility that they might cause harm.

Thus, decades of haphazard use of industrial chemicals provide a background of expectations for today's deliberations on the safety of such chemicals. Pollution of the air, land, and water are not the exception in much of twentieth-century America, but rather the norm. Because industrial practices acceptable in the past have become yardsticks for thinking about what will be acceptable now and in the future, attempts to achieve a cleaner, healthier environment face an uphill battle. The burden of proof rests upon those who seek to change long-existing patterns.

In this context, to define the subject of one's concerns as a "risk" rather than select some other issue skews the subsequent discussion in a particular direction. This choice makes it relatively easy to defend practices associated with high levels of industrial production; at the same time it makes it much more difficult for those who would like to place moral or political limits upon that production to make much headway.

I am not saying that this is a consequence of the way risk assessment is "used," although conservative uses of this sort of analysis are, as we have seen, easily enough concocted. What is more important to recognize is that in a society like ours, discussions centering on risk have an inherent tendency to shape the texture of such inquiries and their outcome as well. The root of this tendency lies, very simply, in the way the concept of "risk" is employed in everyday language. As I have noted, employing this word to talk about any situation declares our willingness to compare expected gain with possible harm.

We generally do not define a practice as a risk unless there is an anticipated advantage somehow associated with that practice. In contrast, this disposition to weigh and compare is not invoked by concepts that might be employed as alternatives to "risk"—"danger," "peril," "hazard," and "threat." Such terms do not presuppose that the source of possible injury is also a source of benefits.

From the outset, then, those who might wish to propose limits upon any particular industrial or technological application are placed at a disadvantage by selecting "risk" as the focus of their concerns. As they adopt risk assessment as a legitimate activity, they tacitly accept assumptions they might otherwise wish to deny (or at least puzzle over): that the object or practice that worries them must be judged in light of some good it brings and that they themselves are recipients of at least some portion of this good.

Once the basic stance and disposition associated with "risk" have defined the field of discourse, all the complications and invidious comparisons I have described begin to enter in. Standards of scientific certainty are applied to the available data to show how little we know about the relationship of cause and effect as regards particular industrial practices and their broader consequences.

Methods of risk/cost/benefit analysis fill out a detailed economic balance sheet useful in deciding how much risk is "acceptable." Statistical analyses show the comparative probability of various kinds of unfortunate events, for example,

Craig Comeau

"Sorrrrry, you lose. Bad luck! But you took that risk when you played the game. Next contestant?..."

being injured in a skiing accident as compared to being injured by a nuclear power plant meltdown. Psychological studies reveal peculiarities in the ways people estimate and compare various kinds of risks. Models from social science instruct us about the relationship of institutional structures to particular objects of fear. A vast, intricately specialized division of intellectual labor spreads itself before us.

One path through this mass of issues is to take each one separately, seeking to determine which standards, methods, findings, and models are appropriate to making sound judgments about problems that involve public health, safety, and environmental quality. For example, one might question how reasonable it is to apply the very strict standards of certainty used in scientific research to questions that have a strong social or moral component. Must our judgments on possible harms and the origins of those harms have only a five percent chance of being wrong? Doesn't the use of that significance level mean that possibly dangerous practices are "innocent until proven guilty"?[11]

Similarly, one might reevaluate the role that cost/benefit analysis plays in the assessment of risks, pointing to the strengths and shortcomings of that method. How well are we able to measure the mix of "costs" and "benefits" involved in a given choice? What shall we do when faced with the inadequacy of our measurements? Are criteria of efficiency derived from economic theories sufficient to guide value choices in public policy? In controversies about the status of the intellectual tools used in decision making, such questions are hotly disputed.[12]

But for those who see issues of public health, safety, and environmental quality as fairly straightforward matters requiring urgent action, these exercises in methodological refinement are of dubious value. It is sensible to ask, Why get stuck in such perplexities at all? Should we spend our time working to improve techniques of risk analysis and risk assessment? Or should we spend the same time working more directly to find better ways to secure a beautiful, healthy, well-provided world and to eliminate the spread of harmful residues of industrial life?

The experience of environmentalists and consumer advocates who enter the risk debate will resemble that of a greenhorn who visits Las Vegas and is enticed into a poker game in which the cards are stacked against him. Such players will be asked to wager things very precious to them with little prospect that the gamble will deliver favorable returns. To learn that the stacked deck comes as happenstance rather than by conscious design provides little solace; neither will it be especially comforting to discover that hard work and ingenuity might improve the odds somewhat. For some, it is simply not the right game to enter.

New Englanders who find acid rain falling on them are under no obligation to begin analyzing the "risks of acid rain;" they might retain some Yankee stubborness and confound the experts by talking about "that destructive acid rain."

There are some players at the table, however, who stand a much better chance. Proponents of relaxed governmental regulations on nuclear power, industrial pollution, occupational safety and health, environmental protection, and the like will find risk assessment, insofar as they are able to interest others in it, a very fruitful contest. Hence, Chauncey Starr, engineer and advocate of nuclear power, is well advised to take "risk" as the central theme in his repertoire of argument. But the likes of David Brower, Ralph Nader, and other advocates of consumer and environmental interests would do well to think twice before allowing the concept to play an important role in their positions on public issues.

Fortunately, many issues talked about as risks can be legitimately described in other ways. Confronted with any cases of past, present, or obvious future harm, it is possible to discuss that harm directly without pretending that you are playing craps. A toxic waste disposal site placed in your neighborhood need not be defined as a risk; it might appropriately be defined as a problem of toxic waste.

Air polluted by automobiles and industrial smokestacks need not be defined as a "risk"; it might still be called by the old-fashioned name, "pollution". New Englanders who find acid rain falling on them are under no obligation to begin analyzing the "risks of acid rain"; they might retain some Yankee stubborness and confound the experts by talking about "that destructive acid rain" and what's to be done about it. A treasured natural environment endangered by industrial activity need not be regarded as something at "risk"; one might regard it more positively as an entity that ought to be preserved in its own right.

About all these matters there are rich, detailed forms of discourse that can strengthen our judgments and provide structure for public decisions. A range of theoretical perspectives on environmental protection, public health, and social justice can be drawn upon to clarify the choices that matter. My suggestion is that before "risk" is selected as a focus in any area of policy discussion, other available ways of defining the question be thoroughly investigated.

For example, are health and safety hazards that blue-collar workers encounter on the job properly seen as a matter of "risk" to be analyzed independently of directly related economic and social conditions? Or is it more accurate to consider ways in which these hazards reflect a more general set of social relationships and inequalities characteristic of the free enterprise system?

One's initial definition of the problem helps shape subsequent inquiries into its features. If one identified the issue of worker health and safety as a question of social justice, there would be less need to do all of the weighing of probabilities, comparing of individual psychological responses, and performing of other delicate tasks that risk assessment involves.

It might still be interesting to do research on levels of air pollution in executive offices as compared to those in factories. Of course, one always wants to have the best scientific information on such issues. But, in all likelihood, such studies would reveal little new or surprising. It is common knowledge that our society distributes wealth, income,

knowledge, and social opportunities unequally. To establish that it also distributes workplace hazards inequitably merely amplifies the problem. Those concerned with questions of social justice would do well to stick to those questions and not look to risk analysis to shed much light.

NOTES

1. Steven D. Jellinek laments this state of affairs in "On the Inevitability of Being Wrong," *Technology Review* 82(8):8-9, 1980.

2. Dante Picciano, "Pilot Cytogenetic Study of Love Canal, New York," prepared by the Biogenics Corporation for the Environmental Protection Agency, May 14, 1980; quoted in *Hazardous Waste in America*, pp. 113-114.

3. See Edmund A.C. Crouch and Richard Wilson, *Risk/Benefit Analysis* (Cambridge: Ballinger, 1982).

4. See Baruch Fischoff et. al., *Acceptable Risk* (Cambridge: Cambridge University Press, 1981).

5. Chauncey Starr, Richard Rudman, and Chris Whipple, "Philosophical Basis for Risk Analysis," *Annual Review of Energy* 1:629-662, 1976.

6. Samuel C. Florman, "Technophobia in Modern Times," *Science '82* 3:14, 1982.

7. Mary Douglas and Aaron Wildavsky, *Risk and Culture: The Selection of Technical and Environmental Dangers* (Berkeley: University of California Press, 1982). See my review, "Pollution as Delusion," *New York Times Book Review*, August 8, 1982, 8, 18.

8. From "Observations," an advertisement of the Mobil Oil Corporation, *Parade Magazine*, December 12, 1982, p. 29.

9. David Noble argues this position forcefully in "The Chemistry of Risk: Synthesizing the Corporate Ideology of the 1980s," *Seven Days* 3(7):23-26, 34, 1979. A similar view is offered by Mark Green and Norman Waitzman, "Cost, Benefit and Class," *Working Papers for a New Society* 7(3):39-51, 1980.

10. Intentions of this sort are evident in the research on risk assessment of The Center for Technology, Environment, and Development at Clark University. See Patric Derr, Robert Goble, Roger E. Kasperson, and Robert W. Kates, "Worker/Public Protection: The Double Standard," *Environment* 23(7):6-15, 31-36, 1981; Julie Graham and Don Shakow, "Risk and Reward: Hazard Pay for Workers," *Environment* 23(8):14-20, 44-45, 1981.

11. Talbot Page discusses issues of this kind seeking a balance between "false positives and false negatives" in judgments about risks in "A Generic View of Toxic Chemicals and Similar Risks," *Ecology Law Quarterly* 7:207-244, 1978.

12. Among the helpful criticisms of cost/benefit analysis are Mark Sagoff, "Economic Theory and Environmental Law," *Michigan Law Review* 79:1393-1419, 1981; and Steve H. Hanke, "On the Feasibility of Benefit-Cost Analysis," *Public Policy* 29:147-157, 1981.

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photo/Greenpeace

ASSESSING RISK

Making Toxics Acceptable

by Joseph Regna

A crowd of a million has gathered in the plaza. A person armed with a gun and six bullets absorbs the scene from a balcony. In a short while, six people will be dead.

Our normal reaction to this would be to try and stop it. But toxic chemicals and hazardous substances are let loose upon the population with basically similar, or even worse, results, and yet we do not stop that—or are, at best, slow to act.

Given the fact that some people will eventually die as a direct result of being exposed to hazardous substances, apologists for this situation might say, "But we do not derive any benefit from the person with the gun. With chemicals, however, we do." Putting aside the question of exactly who gets the benefits and who bears the risks, is it not true that the 999,994 are basically cannibalizing the six? How can we reject what amounts to murder in the case of the person with the gun, yet accept it in the case of the hazardous substance?

This article will explore how risk assessment is being used as part of an ideology to make activities that adversely affect health and the environment seem palatable and acceptable. The thrust of this ideology is that it's O.K. to pollute and injure, as long as we don't overdo it. For industry, engaging in the risk assessment process is cheaper than achieving zero discharge and, perhaps most importantly, diverts attention from the question of who is making the decisions about what is produced in society.

What Is Risk Assessment?

Risk assessment seeks to manipulate exposure data mathematically and statistically to make predictions

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for the outcomes of human exposure to hazardous substances. The goal is to attain a dose-response curve for a particular substance that will predict, for any given exposure level, how many people per unit of population will become sick and perhaps die.

There could be many end points besides death: reproductive effects, mutations, neurotoxicity, liver damage. In this article, I will deal, for illustrative purposes, with cancer as the subject of the dose-response curve.

In some cases, there may already be epidemiological data available, usually information collected from people who have been legally exposed to carcinogens in the workplace. But the quality of such data is often in serious doubt. The need to look back in time and make estimates, varying levels of exposure throughout the workday, varying lengths of exposure among individuals, concurrent exposure to other substances, and incomplete and sporadic data due to job turnover all confound and interfere with the validity of epidemiological data. The usually narrow range of exposure levels over a short time duration also limits the data.

Chronic exposure to low doses of carcinogenic substances is the more typical situation and thus of more concern than the relatively fewer cases of high-level (and shorter term) exposures. To use data obtained at high-dose levels to predict low-dose effects, the dose-response curve needs to be extrapolated from high doses down to the range of low doses.

But extrapolation is not a simple matter of drawing a straight line. Several mathematical models may be used. According to a study by the Occupational Safety and Health Administration (OSHA) on the carcinogenicity of vinyl chloride, the range of risk estimates can differ by six orders of magnitude.[2] So high-dose data may not tell us anything about how people will be affected at low doses over long time intervals.

Animal cancer bioassays provide what is considered to be the next-best way to quantitatively estimate human cancer risks from exposure to toxic substances. Rats, mice, and guinea pigs are typical subjects, based on the assumption that their toxico-kinetics—that is, the way these animals' physiological and biochemical processes handle toxic substances—are similar to that of people. This is not always true, as illustrated in the case of thalidomide, where human liver enzymes activated the substance but the research animals' livers deactivated it.

The animals used in a cancer experiment are split into control and several exposure level groups and also divided by sex. These studies can be quite costly, usually running over half a million dollars, and time-consuming as well, normally lasting over two years. Their cost and the need to collect a range of data from *many* exposure levels in order to get a dose-response curve mean that only small numbers of animals can be used at each exposure level—typically 30-50.

To attain results significantly different from background cancer incidence, high doses must be used. If low doses were employed, one might either not detect any cancers or not see any significant difference from the control group.

The animals are exposed to carcinogens through ingestion, inhalation, or skin contact, then "sacrificed," and their tissues pathologically evaluated for tumors, cell types, and degree of invasiveness. The cancer incidence data can then be plotted at the different dose levels to get the dose-response curve. The results yield sometimes two, usually three, or infrequently four data points.

After the "best fit" curve is plotted, we still have the same problem we had with the human epidemiological data. How valid are extrapolations from high doses to the low-level exposures people will experience? There are also problems involved in translating data from a homogeneous animal population to a heterogeneous human community. In addition, such experiments do not deal with the reality of synergism—that we are always exposed to many substances simultaneously, not just one.

> Suppose the Russians were doing to us what we are now allowing corporations to do to us. We would rise up and declare war. Suppose the Russians had poisoned our earth and contaminated our water. We would call that chemical warfare. We would make speeches and mobilize our army saying that Russia has no right to pollute our air and contaminate our water. In fact, nobody has that right.
>
> **Jesse Jackson**[1]

Scientists, of course, do arrive at risk estimates all the time, but how do they do it, considering the many uncertainties which can creep into the risk assessment equation? They must begin by making a series of assumptions of sometimes questionable validity. As David Hawkins, former Environmental Protection Agency (EPA) assistant administrator for air, noise, and radiation has remarked, scientists who do risk assessment operate from "a desire to have a neat system rather than an understanding of the real world."[3] So these scientists may be assuming their way out of reality.

Incomplete and invalid information usually doesn't stop scientists from finishing an assigned task, so why should risk assessment be any different? Despite all of its failings, risk assessment is genuinely viewed by scientists as an advance over older methods of estimating risk to humans from toxic substances, which can be summarized as: find a no-effect level in animals, divide by 100, and pray.

Who Decides What's Acceptable?

Science, mathematics, and statistics are only part of risk assessment. Once a quantity or range of numbers is arrived at, the question immediately arises as to whether the risk should be taken. In other words, given that a certain substance will kill five out of 100,000 people from cancer at a certain level, is that an "acceptable" risk? Will people and the environment be expected to live with and endure the risk? Control of these decisions (as well as the power and resources in society) lies in the realm of politics, class, and ideology—a netherworld that is Rod Serling at his best—where protection of health and the environment may not enter at all.

Who decides that a certain chemical is to be made, used in a manufacturing process or a product, and distributed throughout society and the environment? Who decides that all of this is acceptable? What is defined as acceptable depends on who is doing the defining.

The chemical industry makes

huge profits from their products, so it has a direct interest in an ever-expanding market for chemicals. With risk assessment, they can scientifically justify setting some acceptable level for a carcinogenic substance's body count. What is gained with risk assessement is the illusion that we can know how many corpses we will eventually have.

The "no" option—no victims, having zero discharges—never enters the hermetically sealed world of risk assessment. This is good news for the chemical industry because zero discharge not only costs more to achieve than allowing some acceptable discharge, but it also may threaten the industry's position in determining what is manufactured in the first place.

Balancing Risk with Benefit

The EPA was given the authority by the 1976 Toxic Substances Control Act (TSCA) to make risk-benefit determinations on most chemicals in society. TSCA gives EPA the power to prevent human and environmental exposure by severely restricting or banning chemicals based on the risk-benefit determination. Other laws give different agencies—like OSHA, the Consumer Product Safety Commission, and the Food and Drug Administration—similar authority.

Say a corporation wants to market yet another brand of hair spray, and the process for manufacturing this product involves a chemical which has tested positive in animal cancer assays. EPA—or another regulatory agency—must decide if the "benefits" of having another hair spray outweigh the "few" deaths from cancer (the risks or costs) from having this new product in existence.

In the context of free market ideology and belief in modern technology, and with all the lobbying by the chemical industry, it is not difficult to see why government agencies approve hazardous products. And backing them up is the risk assessment of the chemical, lending the mantle of scientific legitimacy to what is indeed a political, economic, and ideological decision.

At the 1983 meeting of the Society for Risk Analysis, Chauncey Starr of the Electric Power Research Institute (EPRI) commented, "Each society determines an acceptable risk level."[4] But this is an absurd notion, for only a very few people representing powerful interests in society decide what technologies come into existence, or which chemicals are made and which are not.

An additional implication of Starr's assertion is that risks are shared throughout society—the notion that society is a big family, and we're all in this together, so not only should we share risks, we should accept them. But our society divides those who share the benefits—usually corporations and their stockholders who share the profits—from those who share the risks—usually workers and consumers who share the death and suffering from toxic exposure.

In addition to arguments of lost benefits and shared risk, policymakers often claim that it would cost the industry too much to retool, clean up, or not manufacture something hazardous in the first place. Chauncey Starr again justifies the primacy of cost by asserting that every cost inevitably gets passed on to the public anyway.[5]

The EPA's risk assessment on acrylonitrite, a gas emitted by factories which manufacture acrylonitrile plastics, found that one life would be lost in the surrounding communities every five years. From a business point of view, the cost to the plastics industry of cleaning up, $144 million per life saved, would not be justified.[6] The corporations can be justified in doing as little, in terms of health and safety, as possible, since the costs will come out of our wallets in the end, or the plants will have to shut down and we will lose our jobs.

This ignores the issue of whether people being asked to pay are deriving any benefits from the corporate activity. Also, most people are willing to pay to ensure protection of their health and the environment from toxic substances.[7]

Another argument to justify exposing people to carcinogens and other toxic substances should be mentioned: we are constantly exposed to many other risks which carry a much higher probability of causing injury than do chemicals. Former EPA chief William Ruckelshaus refers to the world as a "minefield of risks."[8] But this idea ignores the need to look at each action or substance and compare its benefits with its risks.[9]

According to Chauncey Starr, "A risk taken out of context becomes a vehicle for public outcry and social/political change."[10] Of course, Starr wants to compare the risks of chemicals to driving automobiles, crossing streets, and eating peanut butter. If we put the risks of chemicals next to their supposed benefits and benefactors, he fears we may get to the truth of the matter. A loud public outcry might result, a very dangerous thing for businesses like Starr's electric power industry and their sulfur emissions.

The Unacceptability of Acceptable Risk

The U.S. government, at least *de jure* in the case of the FDA, has operated under the assumption of the Delaney Amendment to the Food, Drug, and Cosmetic Act: any substance found to be carcinogenic is not to be allowed in any amount and should be banned. The saccharin controversy of the mid-1970s, however, brought a retrenchment from FDA adherence to the Delaney Amendment, causing a need for scientific legitimization for allowing harmful substances in society and the environment.

This led to increased reliance on risk assessment as a scientific justification for a small but measurable body count—the social costs of toxic chemicals—and as a way of diverting attention away from the fundamental issues of who owns the resources and who decides whether a product should be made at all. Risk assessment rescues the system of private privilege in decision-making about what goes on day to day in our society. As Lois Gibbs reflected on her Love Canal ordeal: "If I've learned anything from this experience, it's that science is not separate from politics, no matter how much

If you are one of the people lying on your deathbed dying from a chemically-induced illness, it is not going to make a difference whether only one other person is in your shoes or another 1999 are.

photo/Greenpeace

the scientists pretend it is."[11]

What if we do a risk assessment—with all its limitations—for a chemical, and find it will kill 2,000 people over the next 30 years? Most likely, the response would be "that's unacceptable." But what if the risk assessment found that the chemical will kill two people over the next 30 years? Is that acceptable? If you were one of the people lying on your deathbed, dying from a chemically-induced illness, it is not going to make a difference whether only one other person is in your shoes or another 1999 are.

What should be clear is that risk assessment is a human sacrifice policy. How did it get to be that way? We cannot explain the situation by simply saying there are moral and amoral people in the world, with the former saying, "Ban the chemical," and the latter saying, "Do a risk assessment." People's ingrained tendency to assume innocence until proven otherwise may have the unintended result of serving the interests of the chemical corporations. As David Holzman points out, this policy may not always be the wise one:

> When Mr. Oreffice [president of Dow Chemical] insists—as he does, in effect—that dioxin deserves a presumption of innocence because the scientific case is still not perfect, he is applying the wrong principle. People, not chemicals, deserve a presumption of innocence. People deserve something else, as well: They deserve not to be exposed to chemicals when there is reason to suspect the chemicals may kill or maim them or their offspring.[12]

Another problem is the lack of a public health perspective. The risk of cancer to an individual from exposure to a toxic chemical may, in fact, be low: two out of a million. But in terms of a population of 240 million, that is almost 500 deaths from just one substance. We need to start seeing things in terms of protecting the whole population. One public health maxim says that the best way to cure something is to prevent it from happening. The surest way to prevent cancer from a toxic chemical is not to discharge any of the toxic chemical and not to manufacture it in the first place.

A third problem is the preeminence in people's minds of economic/cost considerations. As Paul Rogers, former congressman and author of the Safe Drinking Water Act, stated:

> There is a movement...which says that efforts to improve our citizens' health must be cost-beneficial. That we must show that the price of preventing ill health and disease and death does not cost more than if we had not made the effort. In other words, if getting sick is cheaper, then maybe we should not try to prevent illness.[13]

Certainly, this brand of bogus economics deserves no place in efforts aimed at life and health.

The critical problem is what gets produced in society and how it's manufactured, and risk assessment diverts attention from this. Decisions about the what and how of production are in private hands and minds. Unless that changes into a situation where all the people make those decisions, risk assessment will continue to be used to justify the decision-making of the few who truly control power.

The way to prevent cancer and other illnesses caused by toxic

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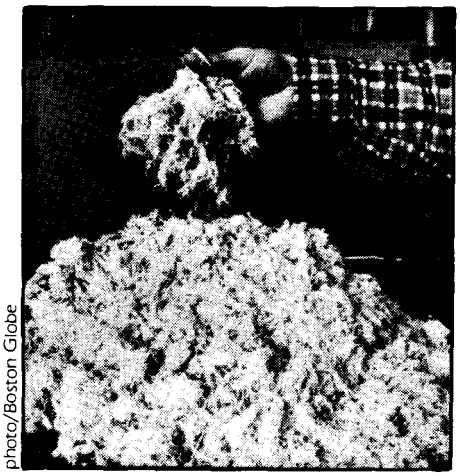

photo/Boston Globe

ASBESTOS FOR SALE

Promoting a Deadly Product

The Mt. Sinai School of Medicine group estimates that one person dies every 59 minutes of asbestos-related cancer. That's about 9,000 deaths per year. And this trend is expected to continue into the next century, since the deaths today are due to exposures from 20-40 years ago.

by Scott Schneider

There is no question that asbestos has gotten a bad reputation over the last 20 years. The turnaround can be dated from 1964 with Dr. Irving Selikoff of the Mt. Sinai School of Medicine's now-classic study of insulation workers. A series of media exposes followed to heighten public awareness. Television documentaries showed workers and their families ravaged by asbestos-related lung cancer and mesothelioma. Even children were tragically dying from asbestos dust brought home on their fathers' clothing.

Meanwhile, over 30,000 product-liability lawsuits have been filed against asbestos manufacturers. In the early 1970s, the courts started finding in the victims' favor, citing these companies for negligence in producing an unsafe product and not warning the users of the dangers. In 1982, when Johns Manville Corporation filed for bankruptcy under Chapter 11, five hundred new lawsuits were being filed each month. They estimated the cost of present and future claims to be worth over $2 billion, more than the value of the entire company.

In the 1980s, public relations for the industry was dealt another blow. Asbestos was uncovered in thousands of school buildings and thousands more office buildings. The spectre of school children inhaling asbestos at school and later having their lives cut short by cancer haunts the industry, as parents clamor for removal.

Concerns have also been raised about asbestos in drinking water from asbestos cement water mains, and in the air from asbestos in brakes. Asbestos has become a general public health menace, not just a tragedy for shipyard workers and their families.

Apparent U.S. consumption of asbestos has plummeted from 829,908 short tons in 1973 to only 217,000 short tons in 1983. World production dropped from almost 6 million tons in 1977 to just over 4 million tons in 1982. The ultimate fear of manufacturers is the banning of asbestos.

The industry, however, is not one to accept defeat lightly. Last year, worldwide asbestos production and U.S. consumption increased for the first time in years. This increase may be due to the economic upturn. But it may result, in part, from the success of the industry's multifaceted campaign for public acceptance. This article will examine industry rationales used in attempts to repair the image of asbestos.

Past Exposures

The industry can no longer deny

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that thousands of people are dying each year from asbestos-related disease. The Mt. Sinai School of Medicine group estimates that one person dies every 59 minutes of asbestos-related cancer. That's about 9,000 deaths per year. And this trend is expected to continue into the next century, since the deaths today are due to exposures from 20-40 years ago.

Many were exposed in Navy shipyards during World War II, while others sprayed asbestos insulation into buildings during the 1950s and '60s. In describing the extraordinarily high exposures of the past, workers commonly talk about "wading in the stuff" or it being "so dusty they couldn't see."

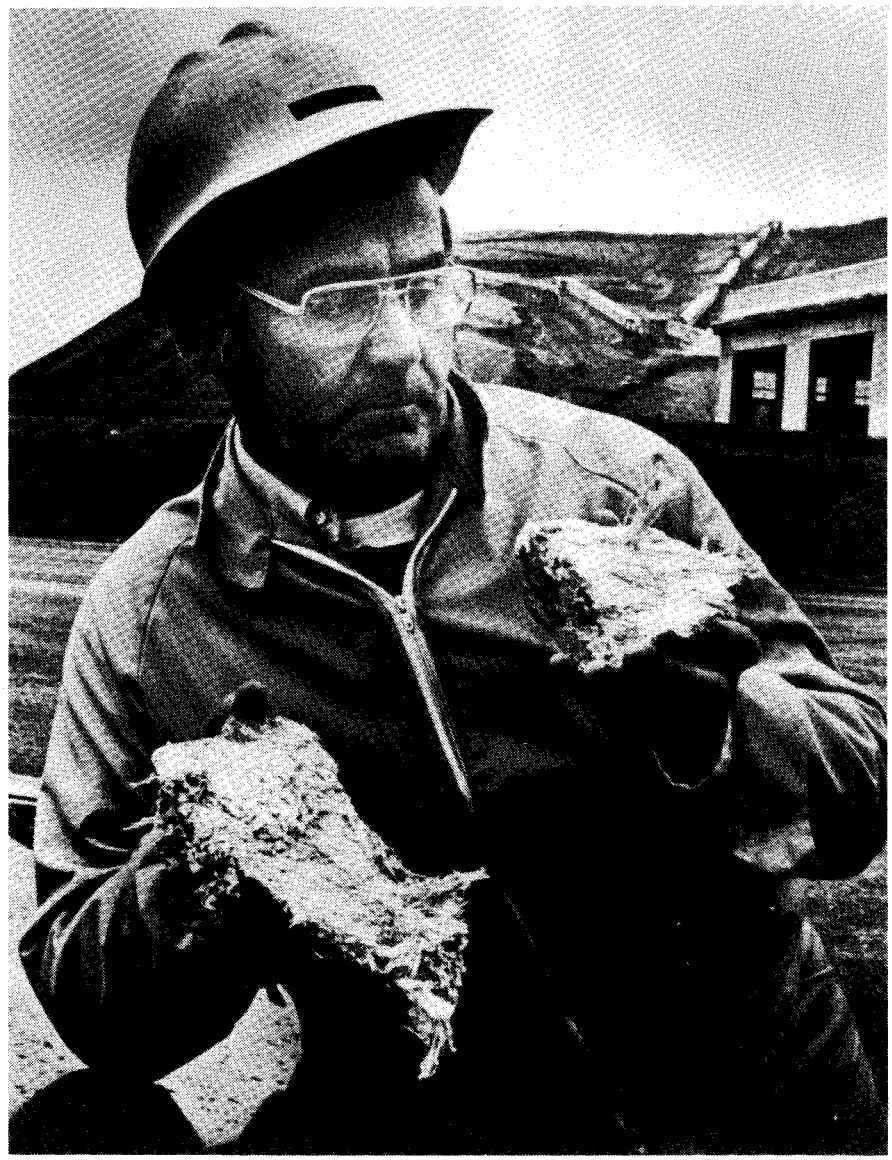
Since 1976, the Occupational Safety and Health Administration (OSHA) limit has been two million fibers per cubic meter. This is commonly denoted as two fibers per cc, which has a more innocuous sound to it. The industry claims that we have "no experience" with workers exposed at or below the current OSHA limit and argues that a two million fiber limit means that it is safe for the industry to sell more asbestos.

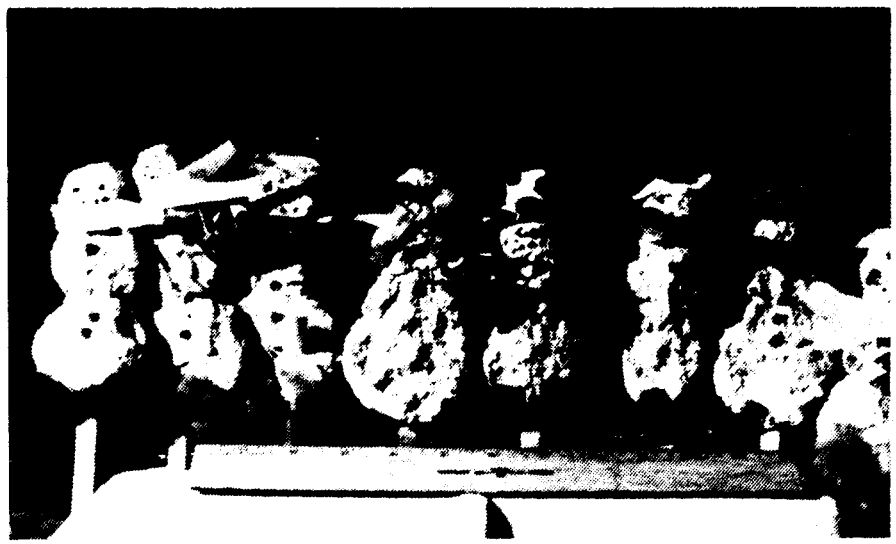
In order to prove that exposure as allowed is too high, we would have to wait 20 years from now to find out if workers exposed today are still dying at excess cancer rates. Since exposure levels are rarely documented, we may never be able to find individuals who were exposed to the OSHA limit for a working lifetime.

Such evidence should not be necessary, however, for regulations to control exposure. It is a well-established principle that for human carcinogens, the less exposure the better. Controlling exposures to the lowest feasible level will prevent the maximum number of cancers.

Science can never make exact predictions or correlations between exposures and effects in particular people because of individual variability and the inaccuracy of exposure data. This very fact has even been exploited by those opposed to regulation. Robert Roland ruled in one case, while chairing the Occupational Safety and Health Review Commision, that failure to monitor the air or to provide medical exams for workers exposed to 100 million fibers per cubic meter of asbestos (50 times the OSHA limit) should not be ruled as a serious violation since there is no evidence that exposure to such a level for only one day is harmful.

Of course, there is no evidence. The





PLAYING WITH ASBESTOS: The clay figures in the bottom photo were made in 1982 by school children using Milton Bradley's "Fibro-Clay", which contained 50% chrysotile asbestos. Labeled non-toxic, Fibro-Clay was sold in powder form until 1976. (Top photo/Boston Globe, bottom photo/Dr. Arthur Rohl, Mt. Sinai School of Medicine)

appropriate experiment is almost impossible since you could never get a large enough sample with only those exposures, and watch them for 50 years until they all die. It is a corruption of the meaning of the word evidence to demand such ludicrous proof.

Aside from the extrapolations from higher doses, we do have evidence that family members and even dogs contracted mesothelioma, a virulent form of asbestos-related cancer. Their only known exposure was merely a few minutes per day from their spouse, parent, or dog owner coming home with contaminated work clothes.

Integral to the asbestos industry's line of argument have been two theories of a threshold or no-effect level for exposure. Low doses, according to the industry, aren't so bad, and besides, exposures are much lower today than in the past. According to the first theory, they claim that the body has mechanisms for dealing with asbestos and therefore a certain amount is not harmful. It is only dangerous once the body's defense mechanisms get overwhelmed. Evidence often cited for this theory is that on autopsy, the amount of asbestos found in the lungs is less than was breathed in during the worker's lifetime of exposure.

The second theory is based on the notion that the time required for a tumor to appear is proportional to exposure. Therefore, at sufficiently low exposures, cancer will not develop in that individual's lifetime. This latter theory is contrary to the vast majority opinion among scientists that no known exposure level is safe for carcinogens.

In addition, the threshold theory does not take into account individual variability. Even at low doses, *some* individuals may get cancer. Some cases have developed after only short exposure periods of a few weeks. Perhaps these people were particularly susceptible or were exposed to overwhelming doses. Perhaps the presence of particular oncogenes in certain individuals were somehow triggered by asbestos exposure, or by concomitant exposure to cigarette smoke, which increases the risk of lung cancer to 10 times that of exposure to asbestos alone.

Children can also develop mesothelioma at a very early age, contradicting the time-to-tumor theory, at least for mesothelioma. So while there may be a threshold for populations which has not been demonstrated yet, there can be none for individuals.

Which Fibers Count

Another way the industry has been attempting to get around unacceptably high levels of asbestos exposure is to change the definitions used by OSHA and thus claim that exposures are much lower. The OSHA definition counts only those fibers that are at least 5 microns long and have a 3:1 length-to-width aspect ratio, but counts *all* fibers meeting that definition, whether they're asbestos or not.

The industry would like to count only those fibers that are asbestos and only those that have a 20:1 aspect ratio. Whereas the optical microscope cannot distinguish between asbestos and other fibers, phase contrast microscopy and electron microscopy can. An aspect of 20:1 is supposed to eliminate the majority of non-asbestos fibers since asbestos fibers tend to be long and thin.

Calls for changing the definition in the name of improving accuracy may actually be aimed at confusing

Asbestos warning on British products.

the question of exposure level. The effects of such changes would be to lower dramatically all the exposure readings so that they are no longer comparable to past measurements, upon which all risk estimates have been based. We won't know what levels of exposure are equivalent to our current standard.

Also ignored is the fact that most asbestos fibers are too thin to be counted under an optical or phase contrast microscope anyway. The OSHA definition was never meant to give an absolute number, but to provide an index of exposure. Unless it can be shown that it does not function well as an index, it should be left as is.

Not All Bad

Another tack taken by the industry is that not all asbestos is bad asbestos. There are three main types of asbestos: crocidolite (blue), amosite (brown), and chrysotile (white). It is commonly thought that crocidolite is the worst or most toxic and has more often been associated with cases of mesothelioma. All forms of asbestos, though, are carcinogenic and must be considered dangerous.

OSHA, in its rulemaking, has declined to distinguish between the various types of asbestos. The American Conference of Government Industrial Hygienists, a private standards-setting body, does recommend a ten-fold lower exposure level for crocidolite and amosite than chrysotile, as do the Canadians and British. The Swedes have banned crocidolite since 1976, and called for a worldwide ban on this type of asbestos.

The asbestos industry would not be adverse to a ban on crocidolite, if in doing so, it could put chrysotile in the clear. Crocidolite represents only a small fraction, about 3%, of U.S. consumption in 1983. Amosite use was negligible. Canada mines chrysotile almost exclusively and the U.S. gets 94% of its asbestos from Canada.

Canada is the second largest producer of asbestos in the world, far behind the Soviet Union, and far ahead of South Africa, which is third. In 1983, these three countries, plus Zimbabwe, accounted for almost 84% of world asbestos production, over half by the Soviets alone.

Even a ban on the use of crocidolite, though, would have no impact for the vast majority of construction workers who are exposed to asbestos already in place, which is often a mixture of several types. Distinguishing among types of asbestos only benefits, if at

Asbestos hangs on a fence around Amatex plant in Mexico, March 1977.

photo/NACLA

all, future sales and perhaps future workers in the mines and mills, and those installing new asbestos products.

The Ban Bandwagon

Some countries, including the U.S., have actively toyed with banning asbestos or certain types or uses of asbestos. Of course, this would be the death of the industry and is their greatest fear.

EPA drafted a rule two years ago to ban some of the major uses, including asbestos-cement pipe and asbestos roofing felt, and cap the total amount of asbestos that could be used for all other purposes. This cap would decrease over a 10-year period, to eventually eliminate all asbestos. By phasing out the use, the price would increase, so theoretically asbestos would be used only for those products where it was most necessary.

The EPA regulation was stalled by the Office of Management and Budget after a number of meetings with the industry and representatives of the Canadian government, from which we get almost all of our asbestos. The Reagan administration dismissed the EPA's proposed ban, stating that the plan would cost too much. The asbestos industry pressured the EPA to drop the ban, claiming it would put them out of business.

This January, the EPA finally published a new phaseout proposal. They want to ban asbestos roofing felt, flooring felt, felt-backed sheet flooring, vinyl-asbestos-cement pipe and fittings, and asbestos clothing. These products accounted for about half of asbestos fiber consumption in the U.S. in 1981.

The EPA's proposal would cut back other asbestos uses by ten percent, and mandate warning labels on asbestos products. The regulations wouldn't affect asbestos already in place, and don't differentiate among different types of asbestos fibers. Hearings on the EPA's proposed ban are scheduled for July.

The principle of substitution has been a time-honored route for industrial hygienists to control exposures to toxic substances. For some uses of asbestos (gaskets, for example), there are few good substitutes. But for the majority of uses there are alternatives.

The search for substitutes has been going on intensively for years. The most commonly touted alternatives are fiberglass—used for thermal insulation and in glass-reinforced concrete—and high-temperature metal alloys—used to replace friction products such as brakes. The industry's campaign against substitutes has focused on both the costs of substitutes and the possible health effects. One ad boldly claimed, "Consider a 2000% cost increase in substitutes to make roof sealants. Then take another look at asbestos." Another ad states that "to ban the use [of asbestos] could result in application of inferior roofing products."

The health effects of substitute materials have also been called into question. The industry argument says essentially, "Don't switch to something that may be just as bad, or worse." Fiberglass *has* been shown to be carcinogenic when injected into the peritoneum, but as yet there is no evidence that inhalation of fiberglass fibers can cause cancer.

One theory on the carcinogenic mechanism of asbestos claims that it is the fiber's dimensions that cause damage to the cells and initiates carcinogenesis. The logical extrapolation would be that other fibers of similar dimensions may also be capable of the same toxicity. One major difference between asbestos and fiberglass, however, is that asbestos fibers split lengthwise into smaller and smaller fibrils whereas glass fibers do not. Also, glass fibers, being man-made, can be formed into whatever diameters you want.

By making fibers wider, they would become "non-respirable"—too large for inhalation. Stopped by the body's filtration system in the nose or windpipe, they would never reach the lungs. Unfortunately, increasingly

thin glass fibers are now being manufactured for aerospace uses. The health effects of these thinner fiberglas fibers is, as yet, unknown.

The "Locked-In" Principle

The damage caused by asbestos occurs after the fibers are inhaled or swallowed. To be hazardous, the asbestos must, therefore, be capable of breaking up into particles.

There are two basic forms of asbestos—friable and nonfriable. Friable asbestos is defined as material that can be crushed or crumbled under hard pressure to create dust. Nonfriable asbestos would include asbestos-cement (AC) products or cementitious asbestos, where the asbestos is "locked in" a cement matrix and not available to be breathed in. The same would be true of asbestos-vinyl floor tiles.

Asbestos companies have long recognized this distinction and have shifted away almost exclusively from friable to nonfriable products. They claim that no hazard exists for the "locked-in" asbestos, but a few scientists have challenged this. Research has suggested, for example, that acidic or "aggressive" water can leak asbestos from AC water pipes, and that higher levels in drinking water may be linked to stomach cancer. Research has also shown higher ambient air levels of asbestos in a room with asbestos-vinyl floor tiles than could have resulted from the wear of the tiles from traffic walking over them.

For consumers exposed to an AC wall or ceiling, there may be relatively low exposures due to wear and tear on the structure. But what about exposures during the installation, fabrication, repair, and demolition of the structure? Use of an abrasive disc saw to cut AC pipe, for example, can produce very high dust levels, with exposures as high as 67 million fibers per cubic meter.

Prefabricated panels or units may be cut to fit at the factory, but inevitably there are last-minute design changes to get a good fit. During the life of the product there are also maintenance operations that require taking a panel out or cutting holes in it. Lastly, the demolition of a building or replacement of an AC product will potentially create hazardous dust levels for workers.

The dust levels from some of these operations can be controlled to a certain extent by local exhaust ventilation. Local exhaust take-offs have been designed by the asbestos industry for tools used in AC fabrication. Other tools such as a snap-cutter used for AC pipe minimize the amount of dust created.

The industry would like to require the use of these "safe" tools and ban the use of tools such as the abrasive disc saw. A major research and development effort has been financed by the industry to develop such tools.

photo/NACLA

Worker unloads sacks of asbestos with little protection, one of the deadliest jobs.

They believe that once use of these tools is mandatory they can claim that exposures have been controlled and no ancillary requirements, such as air monitoring, medical surveillance of workers, and protective clothing, are necessary. And in Germany, where the industry's tool research institute is located, the government has agreed to remove restrictions on the use of AC products if these tools are used.

The New Improved Asbestos

Besides the theory that it is the size and shape of the asbestos fibers that determine its carcinogenicity, by causing damage to the lungs, scar tissue, and subsequent developmental errors as the cells reproduce, there is an alternate theory that the chemical surface properties of the fiber cause cancer.

This theory gains its credence from the notion that the fibers, when breathed in, can carry carcinogens from cigarette smoke on the surface of the fibers. That may explain the synergistic action of asbestos and smoking. Workers who both smoke and are exposed to asbestos have a 55-fold increase in risk of cancer. Nonsmokers exposed to asbestos have only an 11-fold risk.

The asbestos industry has sunk lots of money into research to develop a chemically-modified asbestos fiber. Treating the asbestos with phosphorous gas, they have created "chrysophosphate—a new treated fiber," which they claim has significantly lowered carcinogenicity.

This is of little benefit to the millions of workers and consumers being exposed to the original variety. It may help prop up the industry a bit more, though, and allow continued sales of new asbestos. On the other hand, the treatment process may raise the costs and so increase the competitiveness of substitutes. Even the industry admits that this new product needs further testing before they can proclaim it as "safe".

The Worldwide Campaign

While some countries like Sweden are moving totally away from asbestos and others like the U.S. are tightening restrictions, the asbestos industry has conducted a worldwide campaign to gain acceptance of continued use. They have supported restrictions and requirements they claim will result in safe use of new asbestos.

The Canadian government needs little encouragement to favor asbestos, since asbestos is such an important export and trade item, and the government is so heavily involved in ownership of the industry. The same can be said for the Soviet Union, which produces over half of the world's asbestos. Visitors to the Soviet Union report a rather lax attitude towards asbestos. With the great demands there for building up the infrastructure and the abundant supply of the mineral, it is little wonder they continue to use vast quantities of asbestos.

Even if some countries do effect a ban, the real growth in the industry is in exports to developing countries. As in the Soviet Union, the third world is using large amounts of AC pipe to build its infrastructure. Many asbestos cement factories are also moving to the third world to escape

safety and health restrictions.

Plants in India, Mexico, and South Africa have been shown to have deplorable conditions with no warnings given to the workers. In Canada, the asbestos miners went on strike to get safer working conditions and succeeded in cleaning up the mines. In South Africa, the Black Miners' Union is calling for a complete shutdown of the asbestos mines due to the unhealthful working conditions.

The School Building Scare

Although the industry's main concern is promoting use of new asbestos, the old asbestos already in place continues to tarnish the industry's reputation. The industry has been belittling the risks of existing asbestos to school children and workers, while at the same time warning that removal, which they assume will be done improperly, will invariably result in more dangerous levels than leaving it intact.

While this may be the case for cementitious asbestos, friable asbestos does exist in thousands of schools, public buildings, and private homes, and is regularly disturbed, releasing clouds of deadly fibers, often into the heating and ventilation system. In schools, children bounce balls off the ceiling of the gymnasium, jarring the sprayed-on asbestos insulation loose, or write their names in the dust on ceilings in the hallways.

The industry recently formed an organization to reassure the public called the Safe Building Alliance, made up of former asbestos manufacturers. Their booklet, "What You Should Know About Asbestos in Buildings," compares the risk of going to school in a building with asbestos with the risk of smoking five cigarettes in your lifetime, or driving 1,000 miles in an automobile. Not only does that underestimate the risks, but it compares apples with oranges.

Tony Mazzochi, formerly Health and Safety Director of the Oil, Chemical, and Atomic Workers' Union, has also formed a new organization in New Jersey called Parents Against Asbestos Hazards in Schools, to fight for safe removal. He has horror stories to tell about removal contractors tossing asbestos in the dumpsters outside of schools for students to get further exposed. This may reinforce the notion that it is better to leave the stuff alone than remove it!

In the last few years, states have begun to crack down on fly-by-night contractors cashing in on the boom in asbestos abatement work. Maryland has been one of the leaders to require state certification to do such work. So far, little enforcement effort has been expended by OSHA or EPA in controlling these contractors.

Exposures can be very high, 20-100 million fibers per cubic meter, during removal and rip-out operations, and many times, no protection is afforded these workers. The contractors themselves have been actively promoting safe removal to improve their image. They have created new national organizations to uphold strict standards for safety in removal operations, and regularly hold seminars and conferences on how to improve techniques.

Part of this push comes out of necessity. Insurance companies, many of whom were burned by the Manville bankruptcy and the thousands of lawsuits by victims and school districts, have begun refusing to insure abatement contractors. The problem is growing fast, and the contractors are clamoring for congressional intervention to prevent a crisis, and to allow abatement work to continue.

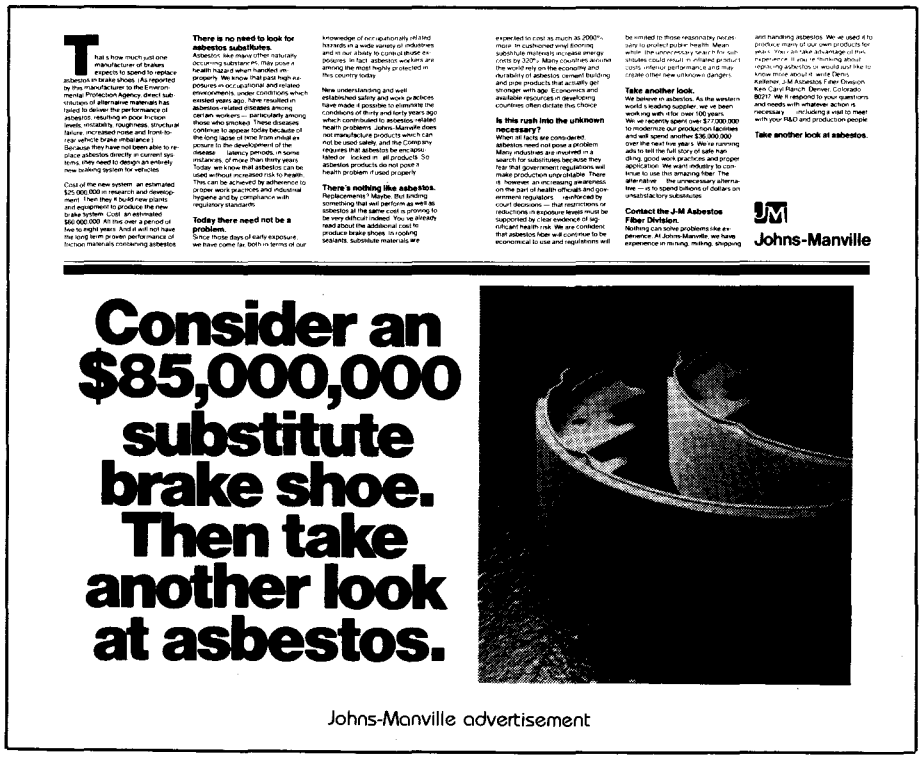
Public Relations vs. Public Health

Asbestos has been with us for thousands of years. Slaves weaving asbestos into cloth were noted to have a "sickness of the lungs" during Roman times. The millions of tons of asbestos in place in buildings today will undoubtedly be with us for the next 50-100 years as the building stock from the 1940s-1970s eventually deteriorates and gets demolished, despite the increased efforts to remove the material.

The question that remains is whether we will continue to place this deadly material into our homes, workplaces, and infrastructure. Although there is little reason to do so, the push is on from the asbestos industry for continued use. The public relations campaign being waged is expensive, sophisticated, and multifaceted. We may be lulled into complacency for the next 20-40 years if we think that a new form of asbestos, a new tool for fabrication, or the "locked-in" asbestos will result in safety.

Then when workers or their families—the modern-day canaries of industrial disease—start dying, we cannot act surprised and claim we had no idea it was so hazardous. By then, the corporations will undoubtedly be insulated from third party liability suits, and the pressure from the court awards for victims will be gone.

History dictates that we cannot be complacent. Complacency has cost us the lives of over 200,000 asbestos victims. The fight against asbestos has intensified, but it must continue to grow if we are to protect ourselves from a future legacy of asbestos disease.



Johns-Manville advertisement

SCIENCE FOR NICARAGUA

SftP travelers: Bill Fowler, Victor Lopez-Tosado, Marilyn Frankenstein, Robert Van Buskirk, Ann Conway, Michael Harris, and Bob Lange

by Michael Harris and Victor Lopez-Tosado

Cooperation in Technology and Science Education

When we arrived at the UNI, the new National Engineering University, on January 3, we were not sure who would be waiting for us.

We arrived during the academic vacation, which coincides with the coffee harvest. Coffee prices are up this year, and *contra* activity in the coffee-growing regions has been virtually eliminated. So we were told that everyone involved in Nicaraguan higher education—students, faculty, and administrators—had gone off to the mountains to pick *el rojito*, as ripe coffee beans are called.

We had gone to Nicaragua—five men and two women, all scientists from Boston-area universities—to meet with our counterparts in Nicaraguan universities in order to discuss our proposal for setting up a program of cooperation in scientific education. Our first project was to send a group of professors to teach in Nicaragua during the academic year starting March 1986. Two of our professors were engineers, so it was natural to make the UNI our first stop.

We were met by Arturo Collado, the academic vice-rector of the UNI, who launched immediately and energetically into a discussion of Nicaraguan higher education and how it had changed during the Sandinista revolution. Some statistics to start with: there are now 30,000 students and over 1,000 full-time professors in the universities, as opposed to 17,500 and 350 under Somoza.

Before 1979, the medical faculty could accept at most 80 students per year; that number has gone up to 600. In the last years of Somoza's rule, women numbered only 4% of engineering students, but 56% of the 1986 entering class at the UNI are women.

And there are new programs. The National Autonomous Universities (UNAN) are offering college preparatory courses to 800 students annually from disadvantaged backgrounds and remote regions. The UNI is introducing degree programs in mechanical engineering and computer science, two subjects which never were taught before in Nicaragua.

The National Engineering University

As of next August, the UNI will begin offering training in Nicaragua's new graduate program, a two-year course in environmental and sanitary engineering. It almost goes without saying that this is the only program of its kind in Central America, and the UNI already plans to accept environmental engineering students from neighboring countries. Presumably, this is an instance of "exporting revolution" that the Reagan administration is so worried about.

The UNI itself is only three years

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old, and is still very much in a state of flux. Housed in a former Catholic school building that still shows signs of damage from the 1972 earthquake that wiped downtown Managua off the map, the UNI looks fated to be continously under construction for the foreseeable future.

This has a positive as well as a negative side. Somoza's neglect of his country has left the Nicaraguans with an unprecedented opportunity to rebuild it from the ground up, in accordance with their goals. Anyone—Nicaraguan or foreign visitor—with enough energy to organize a new project is almost sure to be encouraged, provided the project is seen to be in the long-term interests of Nicaragua.

Nowhere is this willingness to experiment more in evidence than in the universities. The Sandinista revolution can be described as a never-ending conversation about its own future, in which everyone is invited to take part.

Halfway through the first meeting, we were joined by Juan Sanchez, the Chancellor of the UNI, looking fit after a week of picking coffee, as well as visiting professors from Holland and the U.S. The purely ceremonial portion of the meeting ended soon after his arrival. For the rest of the morning, our delegation—individually and collectively—became a part of the never-ending conversation about the future of higher education in Nicaragua, and the role our project could play in fulfilling Nicaragua's goals for that future.

Sanchez and his colleagues had evidently devoted a lot of time to thinking of ways Science for the People could do useful work in Nicaragua. Before we broke for lunch we sat around the table and talked in groups of twos and threes about some of their ideas, which were later proposed to us officially as goals for the SftP Program in Cooperation in Scientific Education.

Excitement and Education

The energy and informality we felt at our first meeting are not unique to the UNI, and go a long way toward explaining why so many people from around the world have been drawn to work in Nicaragua and, in many cases, to relocate there more or less permanently. We felt this excitement again during the sightseeing part of our trip, when people on the street repeatedly came up to greet us—they had read about our visit in the newspapers—and ask us our opinions on science, education, break dancing, and on every other conceivable topic.

Uppermost in their minds was U.S. policy in Central America. Everyone assured us that the *contras* had been "strategically defeated," that they still caused damage in a few regions of the country but they no longer posed a serious military threat. But for this very reason Nicaraguans we spoke with were concerned more than ever about the threat of a direct intervention by U.S. troops. "How would the American people react if that happened?" We couldn't really answer that question, but our visit

ENGINEERING LIBRARY:
UNI's library needs books and journals. Send contributions to SftP.

photo/Bob Lange

Every Project Has a Purpose

I was in Nicaragua during the summer of 1985 to establish contacts for Science for the People's program of cooperation in scientific education with Nicaragua. At the medical university in Leon, I met Rodolfo, the assistant to the director of postgraduate research, in one of the research labs in the pharmacy building. The lab looked like a not-too-well-equipped college chemistry lab, with a moderate amount of glassware and bottles of reagents up and down the counters.

I had interrupted an informal class that Rodolfo was teaching. There were three high school students in the lab who had collected and dried some medicinal plants. Rodolfo was instructing them on the scientific method, uses and properties of the plants, and methods of preliminary analysis of the dried specimens.

I was witnessing a project stemming from a Jornada Cientifica de Desarrollo, an annual conference of applied research projects designed to meet the national development needs of Nicaragua. These students were working on a project to collect, catalog, and analyze medicinal plants native to Nicaragua, with the longterm goal of decreasing Nicaragua's dependence on expensive imported medicines.

Other projects, whose research teams usually involve a couple of professors and several students, included the "Epidemiological Study of the Ten Most Important Diseases of Region II," "Feeding Systems for Beef Cattle in the Dry Season," and "Factors in the Graduation Rate of the School-age Population in the City of Leon and Surrounding Areas."

After the class, the students started work on some elementary analyses of the plants they collected by passing solvents through crushed leaves, while Rodolfo took me aside to explain more about the program. The previous year, they had about 50 projects. That year, they had expanded the program to include over 70 projects.

I left with the impression of a program and way of doing science that truly strives to be a science for and by the people.

—Robert Van Buskirk

left us no doubt as to the Nicaraguan reaction in the event of an invasion.

When we arrived late for a scheduled meeting in Esteli, a woman who happened to be waiting in the office invited us to visit a college for elementary school teachers. Since the universities were not in session, this would be our only opportunity to witness education in Nicaragua, and two of us eagerly accepted the invitation. The director of the school apologized when we arrived, since the only classes that afternoon were in civil defense and nutrition.

Civil defense? It seems most of the students in the school were elementary school teachers from rural areas who were taking intensive courses to improve their teaching skills—a process known as *capacitacion*, which goes on at all times in all sectors of society, and which is the main method devised by Nicaraguans to overcome their historic underdevelopment. Since these teachers—95% of them women—are usually the most educated people in their villages, the government has chosen them as the vehicle to provide basic information about civil defense to remote regions.

The class we visited was a methodical, matter-of-fact discussion, by a tiny woman with a powerful voice, of the relative advantages of different kinds of bomb shelters. The students took careful notes. There was much note-taking in the nutrition class as well.

At the end of our first meeting at the UNI, we were given a copy of the study on which the school's development was based. The tension between the desire to achieve technological self-sufficiency in the shortest possible time and the painful awareness of the shortage of resources—particularly of qualified technicians and scientists—is resolved through a detailed five-year development plan for the university, which takes as its starting point the country's need to develop small-scale industry based on the needs and products of the local agricultural economy. (See table.)

Goals and Objectives

Nicaraguans are serious about defending their revolution, but then, they take everything having to do with the revolution seriously. Every significant reform and important new project is preceded by painstaking studies of needs and resources, and by consultations with organizations representing all sectors of society which stand to be affected by the initiative. A striking example of this is the document entitled "Fines, Objectivos y Principios de la Nueva Educacion"—Goals, Objectives and Principles of the New Education.

This document, which guides

Research and Higher Education in Nicaragua

There are presently four universities in Nicaragua: the two UNANs (National Autonomous University of Nicaragua) in Leon and Managua, the Jesuit-run University of Central America (UCA), and the UNI (National Engineering University), established in 1983. Along with many small technical schools, they are administered by the National Council of Higher Education (CNES), a government ministry created by the Sandinista revolution.

Graduate studies are geared to developing skills and solutions for Nicaragua's greatest developmental needs. The UNI is about to begin a master's program to train sanitary and environmental engineers. UNAN in Leon offers graduate training in integrated pest management, and a new university of agricultural sciences is being administered by the Ministry of Agricultural Development and Agrarian Reform. For advanced medical training, hospitals have been converted into schools for fifteen postgraduate medical specialties.

The ambitious expansion of higher education under the revolution has been accompanied by serious growing pains, inasmuch as the most highly qualified professors have been forced to take administrative positions in government agencies, in CNES, and in the universities themselves. During our tour of higher education programs, we met only one official with a doctorate degree—and this was the president of CNES!

In order to deal with the enormous shortage of professors, the Nicaraguans have had to find ways to stretch their resources. Curricula at the universities are divided into intermediate and professional levels. The three-year intermediate-level program leads to a technical degree. Students in this program are likely to be taught by professional-level students or, in some cases, by high school teachers. The professional-level program takes five years. If qualified Nicaraguan professors cannot be found, courses are generally in the hands of foreigners.

Every Nicaraguan with special skills is constantly being offered new opportunities to employ them, and university students and professors are no exception. Miguel Angel Aviles, director of research and postgraduate studies at CNES, explained to us that, under present conditions, the task of Nicaraguan scientists is to further applied rather than basic research, in order to overcome the historical technological dependency on the West, especially on U.S.-made goods no longer available under Reagan's trade embargo.

The most ambitious initiative along these lines is the Jornada Cientifica de Desarrollo (JCD)—something akin to a country-wide science fair. The idea is to harness the combined imaginations of people at all levels of society—high school students, college students, and factory workers—to try to solve what the Ministry of Planning considers to be the 100 biggest problems facing the country.

For example, Nicaragua cannot afford to import mimeograph ink. This problem was selected as one of the 100 greatest research needs in a recent JDC, and projects were set up at both high school and university levels to try to develop substitute inks which can be produced using locally available materials. Burnt motor oil and mangrove dye were among the materials tested.

Whether or not a particular JCD project actually solves the specific problem assigned is less important, to Aviles's mind, than the experience it provides both students and their faculty advisers in creative thinking. Like most dependent third world countries, Nicaragua under Somoza suffered from a relative abundance of technicians qualified to install and maintain equipment produced in the developed world, and an almost total lack of engineers and scientists trained to design the tools needed to solve problems at hand.

The universities were full of "professors of blackboard and chalk," according to Aviles, who could teach their students nothing about research, an activity reserved for the First World. In the future, Nicaraguan professors—and foreign visitors as well—will be expected to divide their time 50-50 between teaching and applied research.

—Michael Harris

Nicaragua's educational process at all academic levels, was based on the *Consulta Nacional*—National Consultation—of 1981. In this process, more than 50,000 representatives of different organizations, including women, labor unions, and religious groups, along with government agencies assessed the country's academic needs and gave their opinions about the type of educational reforms needed in Nicaragua.

The document, approved by the Sandinista National Liberation Front, will direct Nicaragua's educators in their efforts to defeat underdevelopment and dependency. They are establishing an educational system that responds to the needs and interests of the majority of Nicaraguans, and not to those of the multinationals, oligarchs, and remnants of the *somocistas*.

Some of the problems of training students to be scientists and engineers were surprisingly familiar to us. In Leon, the second largest city in the country, we met Jilma, a leader of the student union at the National University there. Jilma is a 23-year old woman who at 14 left Leon to join the Sandinistas in the mountains and returned two years later to take part in the battle to liberate the city.

The university at Leon is Nicaragua's oldest, and apart from its famous medical school also has the longest-standing programs in basic sciences. But few students choose to follow careers in science, Jilma told us. Why? It seems the students don't like mathematics much. It makes them nervous. Given this attitude, the shortage in technical experts is likely to persist over the short run.

Science for the People's project of cooperation in science education with Nicaragua hopes to address these math and science anxieties. We want to expand the program to include science teacher training and teaching science in high schools. In this component, we would be working with the School of Education at UNAN-Managua and the Ministry of Education, providing assistance in needs assessment, establishing priorities, and recruiting the needed faculty.

Nicaraguan educators expressed—correctly, in our view—that while they train scientists and technicians for industry and research, they also need to train secondary science teachers. High school science teachers are responsible for preparing Nicaraguan youth to enter science fields. They also provide the scientific knowledge needed by all citizens to assist in the building of a new Nicaragua. That will be our new task too.

Teaching vs. Terror

In March, our first group of professors began teaching Nicaraguan students courses in digital engineering, microcomputers, and statistics. The Science for Nicaragua Committee is now selecting candidates to teach next semester, starting in August.

Meanwhile, in Washington, another group of U.S. citizens, with a budget about 100 million times larger than ours, is debating how much of that money should be sent to help torturers and rapists destroy the precious little Nicaragua has been able to build since 1979. Faced with such a powerful and determined adversary, the role of progressive North Americans in promoting peaceful cooperation with Nicaragua has never been so important.

We at Science for the People are planning to launch three new projects during the coming year which were suggested to us at the UNI: a program to improve Nicaraguan universities' access to library materials, in particular scientific journals; a program of short-term visits by U.S. scientists interested in working on research projects or teaching advanced seminars in Nicaragua; and a search for U.S. universities willing to provide fellowships to Nicaraguan graduate students.

Nicaraguans have reminded us that it is still possible to build an independent future, even in Uncle Sam's backyard. What they have asked us to do—to teach their students science, technology, agronomy, and medicine—is meager by comparison, but we are glad the Nicaraguans are willing to make the exchange.

photo/Barry Ingber

EDUCATION FOR ALL: By sending professors to Nicaragua and assisting in science teacher training, SftP supports the goals and objectives of Nicaragua's new education for development and independence.

ENGINEERING NEEDS

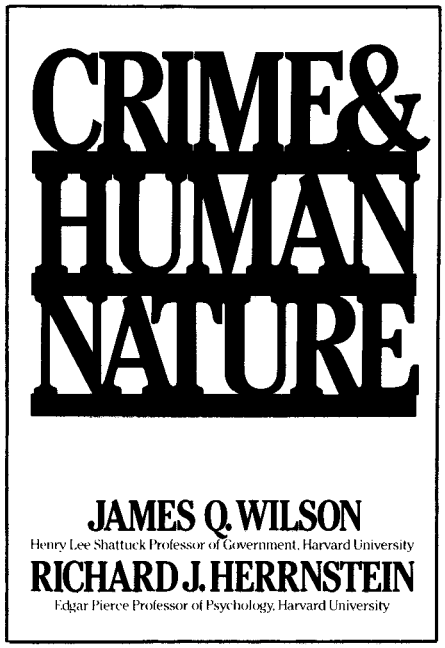
This table, based on the document "Fundamentacion y Propuestas de Desarrollo" of the Universidad Nacional de Ingeniera (UNI) Simon Bolivar, describes the estimated nationwide need for engineers by sector, over the medium term.

SECTOR	NUMBER
Agriculture (excluding agroindustry)	1550
Agroindustry	500
All other industrial	1400
Electrical energy	400
Communications	470
Construction and mining	400
Transport	600
Drinking water	85

Crime and Human Nature

by James Q. Wilson and Richard J. Herrnstein
Simon and Schuster
New York, 1985,
639pp, $22.95

reviewed by Barry Mehler



Crime and Human Nature claims to be a comprehensive examination of the causes of crime.

James Q. Wilson, professor of government, and Richard J. Herrnstein, professor of psychology (both of Harvard University), offer a host of biological and sociological arguments in an attempt to explain why some individuals engage in criminal activity, rather than why some societies experience more crime than others.

They argue that some people are born with a biological predisposition to crime. The constitutional factors associated with the criminal type are: gender, male; age, predominantly young; body type, mesomorphic (heavy-boned, muscular with broad chest, low waist, long arms and large bone joints); intelligence, below average; and personality, aggressive and impulsive. But they also argue that the increase in crime over the past twenty years in the U.S. is the outcome of "liberal secular ideology" advanced since the 1920s which has stressed self-expression over "impulse control." Crime is partially a biological tendency and partially the result of the abandonment of Victorian values.

Wilson and Herrnstein resurrect the works of Cesare Lombroso (from a century ago) and Earnest Hooton (from the 1930s) regarding the existence of a "criminal type." According to Hooton, "Criminals are organically inferior." Crime is the result "of the impact of environment upon low grade organisms."

Wilson and Herrnstein go so far as to comment favorably on a 1939 study of the "facial correlates of crime" by G. Thornton. When 175 University of Nebraska students were shown the pictures of 20 criminals and asked to indentify the crime each had committed, they "discriminated accurately at a level significantly better than chance."

The authors themselves admit that "constitutional factors are not necessarily genetic." But, they write, "personality, intelligence, and psychopathologies of various sorts each involve some genetic inheritance.... The details of inheritance are complex and incompletely understood, but it would be hard to find a serious contemporary student of these topics who denies a genetic contribution, and, in many cases, a substantial one."

This statement is misleading on two points. First, many "serious students" of this subject claim that gene-environment interaction makes any estimate of the genetic contribution to such traits impossible. Second, as Douglas Wahlsten, psychologist and behavior-geneticist from the University of Waterloo, has commented, "so widespread are the errors" in the literature on heredity and I.Q. that "the critical reader" has "good reason to doubt every article published on the topic and to check the arithmetic, algebra and original references before seriously considering the 'findings' and conclusions. The pitifully low standards of scholarship of many who write on heredity and I.Q. are scandalous and unforgivable."

Another major problem with biological arguments is that criminality is not an objective state. Crime is a human artifact based on the creation of a legal system. How can people have constitutional dispositions or genes for some "thing" that changes over time and place?

Furthermore, the supposed correlates of criminal behavior can produce highly acceptable behaviors. The presence of aggressiveness may lead one to an arrest for assault or to a heavyweight championship. The difference between the champion and the assailant is a matter of social circumstances.

For their study, Wilson and Herrnstein looked primarily at "predatory crime"—assault, rape, murder, and theft—and based their estimates of criminal behavior on arrest records and self-reports of illegal actions. Self-reports of illegal activity are of little use for serious crimes, since people do not admit to rape and murder on sociological surveys. Official statistics, on the other hand, do not measure a propensity to criminality but the likelihood of having one's acts defined as criminal by a bureaucratic agency.

This last point is not pedantic. Between 1943 and 1944 Adolph Eichmann helped to dispatch 1.4 million people to their deaths. His actions, at the time, were perfectly legal. A year later his actions were declared "crimes against humanity." At his trial he testified that he would have had a bad conscience only if he had not fulfilled his duty (helping to exterminate people) to the best of his ability. Today, death squads in Latin America and elsewhere engage in murder, rape, assault, and larceny without ever having their acts defined as crimes

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by the agencies of government.

There is no attempt in this book to explain corporate crime. It is striking how narrow and arbitrary is the range of offenses they discuss. There is no concern for organized crime or political corruption. Defense contractors recently admitted to the embezzlement of hundreds of millions of tax dollars from the Department of Defense. Criminal charges in such cases are highly unlikely, yet how many individual street robberies would it take to equal these crimes?

> "Persons who turn out to be criminals usually do not do very well in school."

Wilson and Herrnstein ignore, for the most part, cross-cultural and historical comparisons. Thus, there is no attempt to explain why the U.S. boasts the highest crime rate among Western nations or why crime differs among regions of the country. In looking at the difference between Japan and the U.S., they admit that cultural differences may help explain the divergent crime rates but speculate that such differences themselves might be due to biological factors.

They argue that crime has little to do with unemployment, poverty, capitalism, social policy, bad schools and other such factors. From their perspective, spending money on social welfare would have little impact on crime. On the other hand, Wilson believes crime is substantially increased by liberal secular values. Once again one is baffled as to why there is such a large difference in crime rates between the U.S. and the Netherlands—a society that is more liberal and more permissive than ours. Could it be that the Netherlands, a more cohesive and socialized society, has less crime because they have more social justice?

In discussing the relationship between crime and race, and specifically, the theory that blacks commit more crimes than whites due to lower I.Q. and innate temperamental qualities, Wilson and Herrnstein state that "One cannot dismiss such possible connections as factually wrong without first investigating them. Honest, open scientific inquiry that results in carefully stated findings cannot be ethically wrong, unless one believes that truth itself is wrong."

Of course, they admit that any knowledge may be put to "bad purposes; everything depends on the motives." They display a great deal of tact in this discussion and refuse to dismiss the social or economic causes of black crime despite their general rejection of such factors throughout the book. Could this be because they fear the obviously racist implications of their argument or because they wish to protect themselves against being labeled racist?

This book is more a media event than a work of scholarship. Herrnstein has stated that he and Wilson are merely "the agents of the Zeitgeist." One might just as well say that they are the voice of political and social conservatism. The authors have summarized their conclusions in *The New York Times Magazine*, have appeared on numerous national television and radio talk shows, and are being widely reviewed in the national press. Thus their message, with all of its class and race bias, has reached millions.

Compare that with the response to Elliot Currie's new book *Confronting Crime: An American Challenge* (Pantheon, 1985) which argues that America's problem is its overemphasis on the values of competitive capitalism. You don't need a weather vane to know which way the wind is blowing.

chemicals is to organize ourselves and take the power of decision-making over our lives away from the corporate class. I would argue that this would make much more of an impact on disease and all its fancy measures of morbidity and mortality than any scientific, government, or academic study is capable of doing. We must all act, and in the end, we must and will take control of our lives.

NOTES

1. As quoted in Richard Asinof, "After the Bhopal Tragedy," *Environmental Action*, Vol. 16, No. 5, January/February 1985, p. 11.

2. Occupational Safety and Health Administration, "Identification, Classification, and Regulation of Potential Occupational Carcinogens," *Federal Register*, vol. 45, no. 15, January 22, 1980, p. 5200.

3. Jerry Ackerman, "Computers Analyze Risks," *Boston Globe*, January 16, 1984, p. 39.

4. Chauncy Starr, "Risk Analysis in the Private Sector," Annual Conference of the Society for Risk Analysis, New York City, August 1-3, 1983. (Sponsors for this event included the American Petroleum Institute, the Chemical Manufacturers Association, the Department of Energy, the Environmental Protection Agency, Exxon Corporation, Shell Oil Corporation, and Union Carbide Corporation.)

5. *Ibid.*

6. Ackerman, *op. cit.*, p. 39.

7. See Vicente Navarro, "The 1984 Election and the New Deal: An Alternative Interpretation," *Social Policy*, vol. 15, no. 4, Spring 1985, pp. 3-10, and Vicente Navarro, "The 1980 and 1984 U.S. Elections and the New Deal: An Alternative Interpretation," *International Journal of Health Services*, vol. 15, no. 3, 1985, pp. 359-394.

8. William Ruckelshaus, speech given at the National Academy of Sciences, June 22, 1983.

9. Barry Commoner, "The Risk of Cost/Benefit Analysis," *Science for the People*, vol. 12, no. 3, May/June 1980, pp. 9-10.10. Starr, *op. cit.*

10. Starr, *op. cit.*

11. Lois Gibbs, with Murray Levine, *Love Canal: My Story*, SUNY Press, 1982.

12. David Holzman, "Dioxin: the Science and the Ethics," Environmental Action Foundation, *Exposure*, no. 31, June 1983, p. 3.

13. As quoted in "Waterfall," *Exposure*. no. 18, May/June 1982, p. 2.

New Analysis for New Technology

by Jonathan Beckwith

It is time for a reevaluation of the positions that left and progressive science movements have taken towards technological progress.

I would like to distinguish four different positions that have emerged. The first of these might be called a technocratic one and may well be the foremost attitude toward technology in the world. It exists in societies with varying ideologies—capitalist, socialist, communist—and in pre-industrial countries.

According to this view, all technological progress is beneficial. The improvements in standard of living, in health, communication, nutrition, and reduction in working hours can all be largely attributed to such progress. At its extreme, this viewpoint argues that most of the major problems facing the world can be solved by technology. This view has been tempered, to some extent, by an increasing awareness of the untoward consequences of technology, pollution, disease, and various environmental disasters.

A second perspective on technology, the use-abuse model, argues, as does the first, that most technological advances contribute to the progress of humanity towards a better world, but that such advances can be misused. Progressive forces would argue that much of the misuse of science and technology is due to the concentration of power in the hands of the wealthy sectors of society. They suggest that the solution is to struggle to control the uses to which the technologies are put to insure that the widest number of people benefit.

A third position, based on a strong view of the non-neutrality of science, suggests that certain technological developments and scientific domains arise only out of the needs of the wealthier classes. Therefore, either they are devised as a means of social control or they have no benefit for most people. Such technologies should then be opposed as inherently oppressive.

For instance, it has been argued in *Science for the People* that many of the new agricultural technologies developed within universities have no other purpose than to reduce the ability of farmworkers to battle for better working conditions and wages, eliminating the need for their labor. Otherwise, these devices do not reduce the costs, and even decrease the quality of consumer goods.

Finally, a position which has appeared most clearly in the "back to nature," "greening of America" movements is the sense that most of the world's problems arise from new technological developments. This view holds that due to environmental hazards, scale of operation, or other features, some technologies should be opposed in any political setting or situation. This position is often manifested in an almost reflexive opposition to any such new technology.

The reason I am writing this opinion piece is that I feel Science for the People and much of the progressive movement in this country and elsewhere has been too strongly influenced by the fourth position, and has used the analysis in the third position to a greater extent than warranted. I would like to use the example of biotechnology to illustrate these problems.

Science for the People played a central role in the initial reactions to the development of recombinant DNA research. We supported those who were concerned about the potential health hazards of the

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research and warned of the long-range implications of human genetic engineering. We pointed out that many of the problems that scientists said could be solved by recombinant DNA research, such as world hunger and cancer, were problems caused by social conditions and, therefore, soluble by changes in those social conditions. We argued that the focus on genetic solutions to the world's problems, in fact, distracted attention from efforts at social change.

The concerns of Science for the People made an important contribution to the debate over biotechnology. However, in the process of exposing the dangers of these new developments, we ignored their potential benefits. (A recent exception to this is a special issue of the magazine, "Decoding Biotechnology," published last May.) In fact, there were those of us, including myself, who felt that we might be better off without this research because of its potential dangers.

The consistent opposition to progress in this area, usually manifested in calls for extending moratoria and for very strict regulations, gave an impression that we were not merely calling for more caution and foresight, but rather were attempting to halt the research. This opposition may have been fueled, to some extent, by anti-technology attitudes in the movement.

Yet biotechnology has become a major technology in the world, with significant potential for improving the welfare of people. I will cite two examples. There are now a large number of scientists and medical researchers around the world who are attempting to develop vaccines using the new biotechnological approaches. While it is really not clear yet how successful these approaches will be, the potential is enormous. It may be possible to vaccinate against a variety of parasitic diseases which are among the world's greatest scourges, and against various diseases of livestock which are important for many developing countries.

For instance, Cuba, which is making an extraordinary push in biotechnology, is using these techniques with some success towards a vaccine against a disease of cattle caused by the bacterium *Clostridium hemolyticum*. Another example of the positive uses of biotechnology is the recent program in Argentina which is meant to help reunite the children of the "disappeared" with their grandparents by using the new genetic screening technologies.

Biotechnology is not inherently destructive or evil, nor was it developed as a means of social control. Groups like Science for the People and the Committee for Responsible Genetics should continue to monitor the field and increase public discussion over the potential dangers. However, we should also be focusing on those positive uses of biotechnology and encouraging scientists and the society-at-large to direct the research in such a way as to benefit the most people. By ignoring the beneficial uses of recombinant DNA technology, we have left ourselves out of an important debate over directions of the research. Without our input, this debate hardly exists.

There are other examples where an underlying anti-technology position may have weakened our analysis of important issues. These include reproductive technologies, nuclear power, and the space shuttle. Each of these technologies has serious problems because of the way they have been developed in this society. But does that mean that they are to be opposed *per se*? Have we ignored the significant benefits of prenatal screening in our concerns about the ways in which reproductive technologies can be used to control women? Is Cuba wrong in building nuclear power plants? Are there functions of the space shuttle such as space exploration and industrial processes that could, under the appropriate control, advance human knowledge and well-being?

I don't have the answers to these questions, but I do feel that it is time Science for the People analyzed its past positions on these issues and developed a clearer view of its attitude toward technology.

Science for the People seeks further opinions and comments on progressive responses to new technologies. We hope that this opinion piece sparks discussion in and outside of the pages of the magazine.

In Search of Stability
An Assessment of New U.S. Nuclear Forces

by Peter Clausen, Allan Krass, and Robert Zirkle

Union of Concerned Scientists, 26 Church St., Cambridge, MA 02238, $4.50, 1986

The U.S. nuclear weapons program is swiftly moving toward first strike capability. The Reagan administration's modernization and development of strategic nuclear weapons systems will increase the vulnerability of Soviet military targets to U.S. attack. This nuclear counterforce threatens to reduce crisis stability, according to a new report from the Union of Concerned Scientists.

The U.S. priority of "hard target kill capability"—the ability to destroy hardened nuclear missile silos and command posts in the Soviet Union—will decrease national security, because it intensifies pressures for a Soviet preemptive nuclear strike during periods of crisis, say the authors.

The 86-page report covers the findings of a six-month study by UCS arms analysts Clausen, Krass, and Zirkle. It analyzes four new U.S. nuclear weapons systems now in the process of development or early deployment—the Midgetman ICBM, the Trident II (D-5) SLBM, the Stealth bomber, and the sea-launched cruise missile (SLCM). Their study suggests changes that would improve stability and the prospects for arms reductions.

The authors recommend a reordering of priorities in which lethality and and promptness against Soviet targets are deemphasized in favor of survivability and verifiability of nuclear forces. "A more prudent approach," they claim, "would be for U.S. strategic programs to be directed toward alleviating American vulnerabilities without adding to those of the Soviet Union." *—LF*

Mass Murderers in White Coats
Psychiatric Genocide in Nazi Germany and the U.S.

by Lenny Lapon

Psychiatric Genocide Research Institute, PO Box 80071, Springfield, MA 01138, $10, 1985

Lapon convincingly demonstrates that the philosophy of killing and sterilizing people labeled mentally ill was not a phenomenon limited to Nazi Germany, but was the outgrowth of the international eugenics movement, for which much of the funding and ideology came from the U.S. and England. The world's first compulsory sterilization law for so-called imbeciles was passed in Indiana in 1907, long before the Nazi rise to power.

The book traces the origins of the movement for racial "purification" and sterilization of those considered unfit to the writings of English psychologist Francis Galton in 1869. Interestingly, Galton was the cousin of Charles Darwin, and Darwin's son, Major Leonard Darwin, was the president of the First International Congress of Eugenics, held in 1912 in London.

Another important proponent of the destruction of "inferior" humans was the American Nobel Prize winner Alexis Carrell, who, in his book *Man, the Unknown* (1935) recommended that criminals who had murdered, robbed, or "misled the public in important matters," as well as people labeled insane, should be "economically disposed of in small euthanasia institutions supplied with proper gases."

In another section of the book, Lapon follows the careers of former Nazis in the U.S., and quotes from interviews that he conducted with a number of American psychiatrists who had practiced or studied in Nazi Germany. Most of them, of course, denied knowledge of the euthanasia program that wiped out the vast majority of psychiatric inmates during that period.

The book brings the history of psychiatric crimes up to date with a thorough discussion of deaths and permanent brain damage caused by current psychiatric practices in the U.S., such as the use of phenothiazine drugs like Thorazine, Prolixin, and Mellaril, and electroshock. One of the more horrible effects of phenothiazines is a form of permanent brain damage called tardive dyskinesia. The symptoms include "slow, rhythmic and involuntary movements of the face and limbs; cheek-puffing; lip-smacking; chomping or chewing of the jaws; undulation of the tongue or repeated tongue thrusts; difficulty in swallowing or speaking...." The list of other devastating effects of these drugs includes "unexplained death."

Lapon quotes Peter Breggin, a psychiatrist and author of a book on electroshock, describing some of the effects of that "treatment": "death, amnesia and other kinds of memory loss, brain hemorrhages, cell death, brain death, bleeding, brain-tissue destruction, damage to the central nervous system, coma, permanent mental dysfunction, difficulties in concentration, confusion and incontinence, impairment of learning, and of course, fear."

The last section of the book is a history of the psychiatric inmates ("mental patients") liberation movement in the U.S., from its beginning in 1970 to the present. Lapon describes the annual ex-inmates conferences, the sit-ins and demonstrations protesting forced psychiatric treatment, the patient-run refuges and drop-in centers, the court battles, consciousness-raising groups, books, films, and newspapers that the movement has created.

—Jenny Miller

The Struggle for Workers' Health

A Study of Six Industrialized Countries

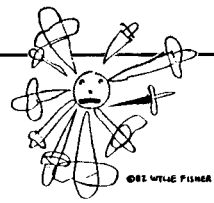
by Ray H. Elling

Baywood Publishing Co., 120 Marine St., Farmingdale, NY 11735, $36 plus $1.50 postage, 1986

"It is the central thesis of this book that a stronger workers' movement will lead to more healthy and safe working conditions," Ray Elling states in his introduction. That expectation is borne out in the occupational health and primary health care systems of the countries he studies. With the exception of Sweden, where medical school training in occupational health is as poor as it is in the U.S., countries with stronger workers' movements deliver better work-related health care. In general, governmental protection of workers' health can be correlated to the strength of a country's labor movement.

Elling researched six countries where occupational safety and health legislation and activity flourished during the late 1960s and 1970s: Sweden, Finland, East Germany, West Germany, the United Kingdom (Great Britain and Northern Ireland), and the United States. Except for the Germanies, each of these countries has community-based workers' health groups (called "COSH-type" groups, after the U.S. coalitions on occupational safety and health), composed of union members and leaders, health workers, social scientists, and technical and legal professionals.

In rating the countries studied on the strength of their workers' movements and the development of occupational health policy, education, organization, financing of services, and general public awareness and information, the U.S. consistently ranks at or near the bottom, with Sweden and East Germany at the top. —*LF*



Planet Earth in Jeopardy

Environmental Consequences of Nuclear War

by Lydia Dotto

John Wiley & Sons, $14.95, 1986

Geared to a general audience, this book summarizes a two-volume technical report on the environmental consequences of nuclear war that was produced by the Scientific Committee on Problems of the Environment in 1985. Over 300 scientists from more than 30 countries participated in the study, exchanging their ideas and participating in workshops across the globe.

Extrapolating from computer models based on a hypothetical strategic nuclear war scenario consisting of four phases, the book details, chapter by chapter, the expected devastation: fire, blast and immediate effects; smoke and dust; climatic consequences; changes in the chemistry of the atmosphere; radiation and fallout; the biological response; agriculture and ecosystems after nuclear war.

The report concludes, "There is compelling reason to believe that a large-scale nuclear war could be not only war among combatant countries, but war on all the Earth's nations and peoples, and upon the global environment and biosphere as well." Even those not directly affected by environmental and atmospheric consequences would be indirectly affected, since food supplies would run out before agricultural productivity could be resumed. "As a result," the report states, "the majority of people on Earth face the risk of starvation in the aftermath of a large-scale nuclear war; for those in non-combatant nations, famine could be the major consequence."

— *LF*

Grassroots

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about "what happens when you put this on 45,000 acres of potatoes." And with more products on the way, states Wilker, "concerns about public health and safety are especially real and valid."

Already, Monsanto has applied to the EPA to field test a bacterium that will kill pests in the soil. In light of AGS violations, Wilker and Doyle joined staff scientists from the Natural Resources Defense Council and the Environmental Law Institute in calling upon the EPA to suspend approval of the AGS field test pending an investigation, and to dency approval to any further field tests until the agency adopts clearer regulations on risk assessment requirements, containment, and monitoring in this area.

In light of EPA's recent actions, these demands seem largely to have been met. But Wilker is quick to stress that "although these are responsible regulatory precedents, it is unclear how soon companies like AGS will be back in the field. Meanwhile many unresolved problems remain about how this area will be regulated and these should be addressed before the industry is allowed to proceed."

Wilker's words take on added meaning in light of the USDA case currently being heard before the subcommittee on Investigations and Oversight of the House Science and Technology Committee.

As things stand now, the future for open-air testing of biotechnology products seems uncertain. According to the General Accounting Office, which just completed a study, there are some 87 genetically engineered products currently proposed to the USDA, 11 of which seek field tests this year, and all of which hang in the balance pending the results of the current hearings.

Monsanto's proposal to field test their bacterial pesticide in St. Louis has been put on hold by the EPA until further safety data is submitted. And it is unclear when AGS's Frostban research will return to the field.

Nonetheless, controversy about deliberate release is far from over. Public pressure and vigilance will be needed to insure that the industry is monitored and that the public is truly protected.

FREEZE ON FROSTBAN

Chilly Reception for Biotech Field Test

by Seth Shulman

In a controversy that points up clearly the inadequacy of current government regulation and control of the biotechnology industry's driving quest to bring products to market, a flurry of recent developments has outraged concerned citizens and members of the scientific community alike.

While genetic engineering has been developing rapidly in the laboratory in recent years, debates on a number of levels—in scientific conferences, in regulatory memoranda, and in several bills before Congress—have wrestled with the issue of how to insure public health and environmental safety as these genetically-altered products are field tested and brought to the market.

In the midst of such debate, two incidents have come to light of flagrant violations of the few guidelines that do exist for this research. In the most recent case, it was discovered recently that the U.S. Department of Agriculture (USDA), unbeknownst to almost anyone watching the development of the field, had approved the first field tests of a live, genetically altered virus, and had even licensed its sale on the market as a vaccine for livestock.

The USDA had taken these actions without ever informing the public or state representatives where the field tests were conducted. They never consulted the scientists on the scientific review committee overseeing agricultural biotechnology research, and didn't notify Congressional inspectors from the General Accounting Office.

Andrew Joslin

In the second controversy, one that has been watched extremely closely by members of the biotechnology industry and environmental groups alike, a California-based biotechnology firm violated guidelines set by the Environmental Protection Agency (EPA) when they undertook open-air testing of a genetically altered bacteria almost a full year before receiving EPA approval to do so.

These two cases come as the latest rounds in an ongoing debate about how to insure public health and environmental safety as increasing numbers of biotechnology companies and academic researchers seek to release live, genetically engineered organisms into the environment. It is perhaps the most heated fight the field of genetic engineering has seen

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since the initial public concerns raised about recombinant DNA research in the early 1970s.

The current situation, described by one observer as "regulatory mayhem," has three regulatory agencies—the USDA, the EPA, and the Food and Drug Administration (FDA)—all attempting to monitor and regulate their respective areas, each with their own scientists and guidelines. Agricultural products, including new seeds and livestock vaccines, fall under the jurisdiction of the USDA. Pesticides and environmental products are in the EPA's bailiwick, and pharmaceutical products are the responsibility of the FDA.

Two other government agencies are also monitoring biotechnology developments. The influential National Institutes of Health's Recombinant DNA Advisory Committee (known as the RAC) and a new group in the Office of Technology Assessment are attempting to oversee the entire field. In addition, two separate bills are pending before Congress to try to handle this emerging technology more uniformly and responsibly.

As we go to press, the USDA case regarding the genetically altered virus is just coming to hearings, but the latter case involving the California firm and the EPA has reached some closure. As a result of EPA investigations, federal and local hearings, and vigilant public scrutiny and concern, the EPA revoked the company's license to test their product and levied the first fine ever issued to a biotechnology company.

The EPA's action comes as at least a temporary victory for concerned citizens and ecologists who have opposed the open-air testing of genetically altered organisms, pending further study of possible environmental effects. And the details of this case are especially instructive, as the public will undoubtedly face many more such incidents before clear regulation and monitoring are in place.

At stake is the way in which the rapidly emerging biotechnology industry will be allowed to proceed. And for agribusiness, the implications of this huge, evolving industry promise to be as dramatic as those brought on by the synthetic chemical industry in the 1940s and 1950s.

In November 1985, a California-based company called Advanced Genetic Sciences (AGS) received EPA approval for the first known test to "deliberately release" genetically altered bacteria into the environment. AGS proposed to spray an outdoor plot of strawberries in Monterey County, CA with a genetically engineered bacteria designed to increase the crop's resistance to frost.

The product, whose trade name is "Frostban", is an altered strain of a naturally occurring bacteria *(Pseudomonas syringae)* which lives on the leaves of most plants and causes them to crystallize in below-freezing temperatures. By altering the genetic makeup of the bacteria, AGS intends for their new strain to crowd out the naturally occurring bacteria, thereby allowing the plants to live in below-freezing temperatures.

Because of concerns about the safety of the research, local opposition began almost immediately after the test site was announced. But the issue became particularly heated in Monterey County in March when newspaper reports uncovered that AGS had already conducted open-air tests of Frostban in violation of EPA guidelines for containment of the bacteria.

Hearings and news reports uncovered both corporate misdeeds and EPA negligence. They found that the company was injecting about 45 fruit trees with their Frostban bacteria on the roof of their Oakland, California laboratory for almost a year before receiving approval to test it in the open. Further local investigations found that the company had conducted their "contained" experiments in greenhouses with open windows, and that their proposed "remote" test site actually lies on the edge of a residential neighborhood near Castroville, California.

Local hearings revealed that EPA officials had not inspected the site when it approved this first-ever test, so were not aware of the proximity to residents' homes. Nor had the EPA officials known about AGS's containment violations because they undertake little or no monitoring of laboratories in this emerging field. In the words of one EPA official, the report of AGS's unapproved outdoor experiment came as "a real shock."

All of these factors served to outrage the local community, and spawned a citizen's group called ALERT (Action League for Ecologically Responsible Technology). As Glenn Church, president of ALERT and a tree farmer in Monterey County stated, "The company has no credibility now with local citizens, and it seemed clear that we couldn't rely on the regulatory agencies to do their jobs on their own. These facts have fueled concern that the whole industry is just a disaster waiting to happen, especially when we realize that things that are being developed now make this whole Frostban thing look benign."

After a local injunction was brought against this research by county officials, the EPA investigations led to the suspension of AGS's permit to conduct the Frostban test and a $20,000 fine for their disregard of EPA regulations. But the violations may have never reached the public. The role of public pressure and vigilance in this case was clear.

What's at Stake

Says county Supervisor Sam Karas about the findings of AGS violations, "The big thing that has changed is their credibility. Even people who were feeling neutral about the research are now looking at it more skeptically." The director of EPA's Office of Pesticide Programs, Steven Schatzow, agrees, stating that "the industry has shot itself in the foot."

Concerns raised about the specific "ice minus" research, as it is known, range from fears that large-scale use could alter rainfall patterns to worries of pathogenicity from the bacteria itself. But Jack Doyle, who heads an agricultural project for the nonprofit Environmental Policy Institute in Washington, DC, and others like Nachama Wilker, director of the Boston-based Committee for Responsible Genetics, are more concerned about what will happen once the door is open for this type of product.

In the case of ice minus bacteria, Doyle is worried less about spraying 2,400 strawberry plants than he is

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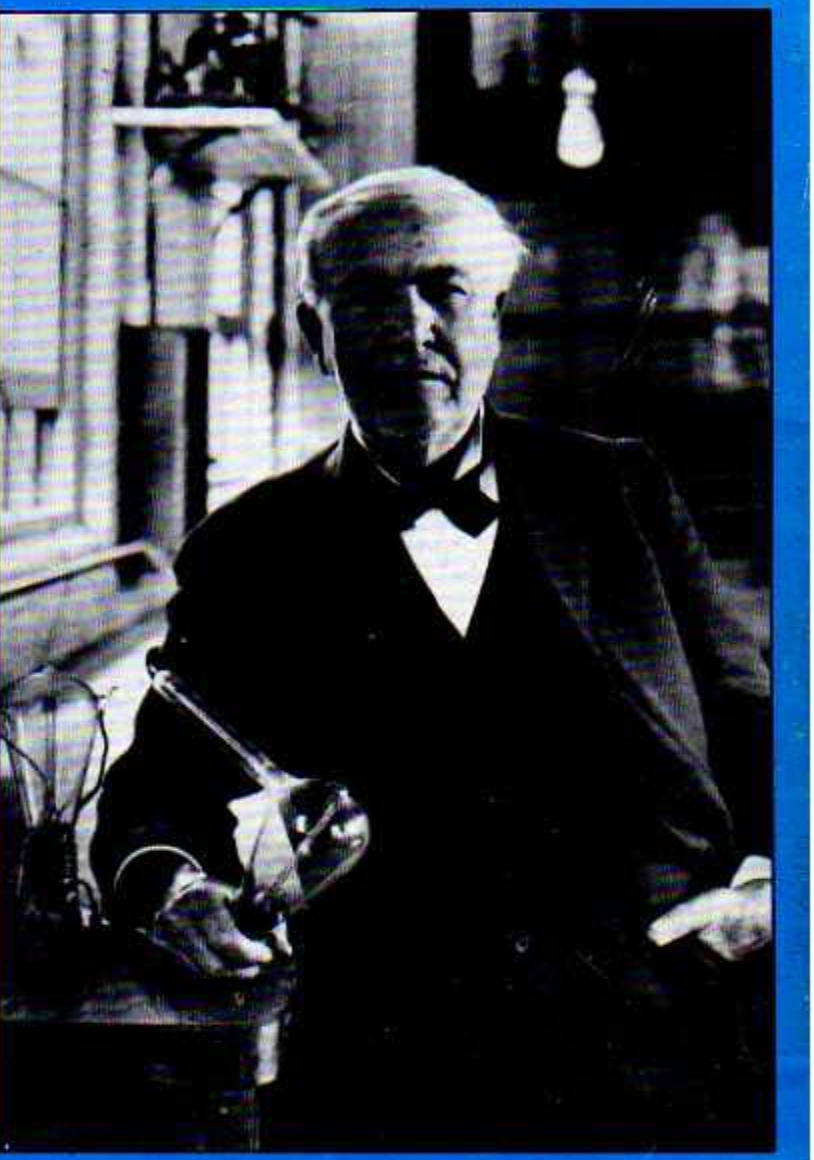

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