

One Year Later: Indian Perspectives on Bhopal

SCIENCE FOR THE PEOPLE

Vol. 17 No. 6

\$2.50

DEVELOPMENT AND DISASTER



Secrecy & Accountability for Bhopal Urban Children & Malnutrition
Occupational Health in Nicaragua Toxic Ireland



In July, seven months after the chemical leak that killed thousands of Indians, Union Carbide formally shut down its pesticide plant in Bhopal. Company and Indian government officials claimed that public opposition to any industrial operations at the site prohibited future use of the facility. Yet Indian labor leaders, workers, and neighbors of the plant have fought to keep Carbide's doors open.

Why would the victims of this disaster fight for Union Carbide's survival? Because with Carbide's closing, there are 700 fewer jobs in a region already suffering high unemployment. Labor leaders asked the company to provide money to develop a "safe and socially useful production line," possibly products from locally grown soybeans, at the Bhopal plant.

Is Union Carbide responsible for providing safe jobs and safer industry after Bhopal? Local residents and employees at the plant believe that Carbide has a moral responsibility to keep the plant open and prove their concern for the victims and workers who have no unemployment compensation. But Carbide officials said that pending damage suits from Indian victims prevent them from converting production at the plant and reopening. They'd rather make victims prove their injuries than change their operations.

"To mumble 'Sorry' and offer cash is an intolerable response in light of the organized effort that profited from the conditions that produced the disaster," wrote Robert Engler in a special issue of the Nation last spring. "To accept the proposition that people of less technologically advanced regions, abroad and at home, are unfortunate but necessary industrial fodder so that the rest of us may progress to unlimited splendor is unconscionable. It suggests how much we have yet to learn about our common humanity, how genuine freedom may have to be shared before it can be thoroughly lived and enjoyed."

This special issue of Science for the People looks at industrial development in the Third World, and the rationale for the industrial control of technology. This rationale is rooted in our political economy, which measures success in terms of profit and the right of corporations to develop technologies without public planning and international involvement in decisions.

The problems of third world development—poverty, illness, malnutrition, pollution, injustice, repression—are not technological, but social and political. When technology is used to solve these problems, it must be controlled by the people that technology affects.

Thanks to Science for the People's environmental study group, who helped to plan and produce this issue of the magazine.

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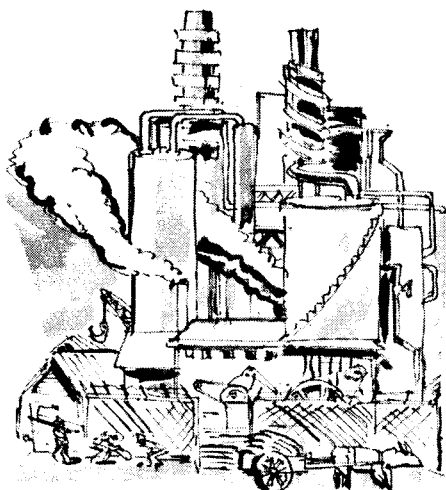
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Rowley Printing, 395 Main Street
Rowley, MA 01969

SUBSCRIPTIONS: U.S. one year/six issues: \$15. Foreign rate: \$21. U.S. libraries/institutions: \$24. Foreign libraries: \$30. Member subscription (includes the magazine, our newsletter and other communications): \$25. Foreign subscribers must remit in U.S. currency, with either an International Money Order or a check drawn on a U.S. bank.

SCIENCE FOR THE PEOPLE is available to bookstores on consignment from the publisher or through Carrier Pigeon Distributors, Box 2783, Boston, MA 02208. The magazine is available on microfilm from University Microfilms, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Science for the People is indexed in Alternative Press Index, Box 7229, Baltimore, MD 21218.



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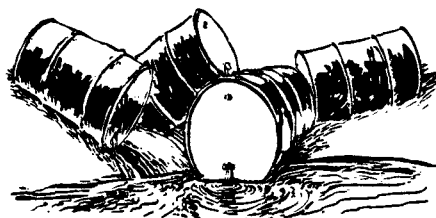
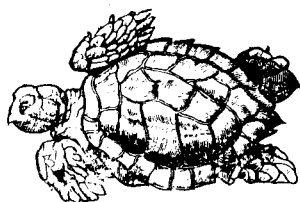
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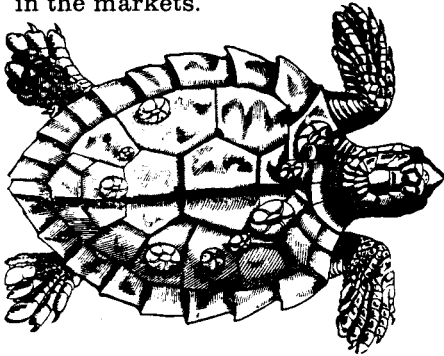
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Join the Turtle Militia

Nicaraguan conservationists are organizing to save endangered marine turtles with the same energy they're using to turn back the U.S. *contra* war.

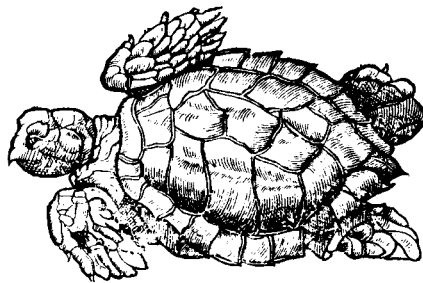
A 40 percent cut in the natural resource department's budget has forced Nicaraguans to find ways to make conservation self-supporting. Last summer, biologists from IRENA, the natural resource agency, began a pilot project designed to buy a limited number of turtle eggs, a local delicacy, from traditional collectors while funding research and protection of the turtles by reselling the eggs at a fixed price in the markets.



Thousands of Hawksbill, Atlantic Olive Ridley, and Leatherback marine turtles converge on Nicaragua's Atlantic Coast from May through December to lay their eggs in a new national wildlife refuge about 90 kilometers south of Managua, in the Department of Rivas. Members of the Sandinista Police, students from the University of Central America's ecology school, and most recently the Jose Zamora Conde Brigade—a North American reforestation brigade—have joined the turtle militia. Volunteers and police patrol the beach, collect data on turtle behavior, and help administer the project.

Until the Chacocente Wildlife Protection Area was formed in 1982, 3,000 machete-wielding, drunken outsiders descended on the beach and built temporary shelters while they awaited the

monthly *arribada*—the four-day arrival period when 4,000 to 6,000 turtles come ashore to lay their eggs. Collection of eggs laid by Leatherback turtles, the most threatened species, which can be as large as five feet long and weigh 1,300 pounds, is prohibited. The other two marine species measure two feet long and weigh about 100 pounds each.



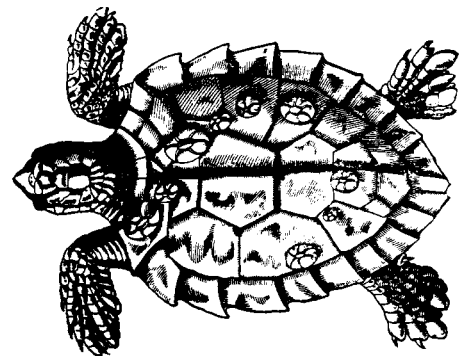
In the old days, wealthy buyers would buy the eggs at low cost and resell them at premium prices in the markets. Magaly Urbina, IRENA's regional director, hopes that eventually all the turtle eggs will be protected. She said limited collection may be allowed to give the precious food source to those who need it most—the sick and the aged. This won't be possible until the project receives more funding. There were 350 permits granted this year to area residents allowing them to collect eggs during certain hours and certain *arribadas*.

The project has had mixed success. The beaches have been orderly and fewer eggs have been disturbed, project coordinators say. Local people continue to receive supplementary income and food from the eggs they collect. However, transportation problems related to shortages created by the war caused 40,000 dozen eggs to spoil before reaching markets in Managua, leaving the project in debt.

Plans to mark more turtles with rings to better track their behavior have been stymied by a shortage of foreign currency.

The money must be available to pay people who report international sightings of the marked turtles before the markers can be applied. The last marking was done in 1982.

Lorenzo Cardenal, responsible for Nicaragua's national parks, says conservation is not a luxury in Nicaragua, but an economic necessity. Economic and environmental needs must be pragmatically combined for the nation to survive, he said. Resources cannot be stripped further, as they were before the revolution by dictator Anastasio Somoza and U.S. corporations. The country needs them for the future.



Magaly Urbina, scientist in charge of the turtle project, said Nicaragua has a special responsibility to protect the turtles because they are an international resource. Scientists have been hampered in their efforts to study the marine animals and the dry rain forest which borders their nesting area. Lack of foreign exchange and limited research funds have isolated them from international scholarship.

For more information about this project, to help aid Nicaragua's conservation efforts, or to have a Boston area brigade participant speak to your group, contact Julie Ogletree at (617) 547-2645, or write Environmentalists for Nicaragua, Activities Office, A-Frame, University of California, Santa Cruz, CA 95064

—Julie Ogletree

Appetizing Info

Ever wonder what's in that Big Mac? Well, you may find out soon. The Washington, DC-based Center for Science in the Public Interest has a campaign underway to require fast food chains to list ingredients on the food's packaging.

As you might imagine, fast food chains aren't too thrilled about the prospect of letting out such secrets onto the plastic boxes that hold the burger, or the bags that hold the fries. After all, listing a lot of chemicals might make some customers lose their appetites. In the words of a food industry lobby group, the National Restaurant Association, "technical terms on fast food packaging would cause undue alarm and anxiety."

Maybe so, but wouldn't you rather have the information to decide what you do—and do not—eat?

Censoring Science

To help citizens of Lavallette, New Jersey discover what chemicals Ciba-Geigy was dumping off their beach, Greenpeace sent samples of the outfall pipe to a testing firm in Buffalo—the Life Support Products Division of Aro Corporation.

Here's the reply they received: "In view of your organization's 'militant' posture, it would be in the interest of all parties if we sever our relationship." When Greenpeace threatened legal action to obtain the chemical analysis results, the lab forwarded its report. All but a few of the 115 chemicals tested for were found at levels under the detectable limit. Ciba-Geigy's own analyses show levels much higher.

Whose lives are the Life Support Products analysts supporting?

Outlawing Toxic Accidents



Since the tragedy of Bhopal, regulators and legislators alike have been considering what new laws and regulations are necessary to prevent its repetition in the U.S. Unfortunately, many of these proposals are based upon a misguided effort to treat the symptoms rather than the illness. They focus on crisis management instead of safe siting, operation, and design of chemical plants. Such a myopic emphasis might be warranted if the problem was small, but in fact, spills and emissions of extremely hazardous chemicals are endemic.

A recent report conducted for the Environmental Protection Agency (EPA) by Industrial Economics Inc. of Cambridge, MA confirmed the magnitude of the problem. The study, according to the *New York Times*, documented almost 7,000 industrial accidents in the US during the last five years that killed more than 135 people and injured nearly 1,500. The amount of chemicals released by these accidental spills and emissions totaled 420 million pounds and caused the evacuation of at least 217,457 people. Since the study employed only selected data sources not covering the entire country, the authors estimated the true number of accidents to be two-and-a-half to three times higher.

In response to the accident in Bhopal, the EPA has developed lists of proposed acute hazards, which will be disseminated to states to determine which facilities present a potential hazard. With this information, states can plan for emergencies if an accident occurs. Unfortunately, the criteria for inclusion on the list is so rigid that chemicals which cause burns, skin or eye irritation, or respiratory effects—short of

death in a short-term exposure—are excluded.

A similar proposal, amended to the Superfund reauthorization bill of 1985, was introduced by Senator Frank R. Lautenberg (D-NJ). His proposal would require the EPA to compile a list of extremely hazardous substances. Any facility which held reportable quantities of such chemicals would have to inform state authorities. The governor of each state would form "emergency districts" to deal with emergencies at any of these facilities.

In Massachusetts, a state committee is also considering the regulation of extremely toxic substances. Initiated in response to the controversy over the testing of nerve gas at the Cambridge-based Arthur D. Little Co. (see "Newsnotes," August/September 1985), the committee's mission is to prevent accidents before they occur. They will consider regulation through "toxic zoning"—analyzing the safety of a facility not just by its physical integrity but also by its proximity to population centers. A regulation based on such criteria might prohibit selected dangerous activities and industry near residential communities, schools, hospitals, or commercial districts. In addition to the dangers of industrial pollution, the committee is concerned with the hazards of academic and industrial research activities with highly toxic chemicals.

In spite of the seriousness of the accident in Bhopal, few comprehensive and thoughtful solutions have been proposed for the U.S.—the Massachusetts committee being one exception. Preventative medicine is demanded, rather than symptomatic treatment, even if it is a bitter pill.

—Dan Grossman

Watching What You Teach

Are there any leftists teaching at your local university? Accuracy in Academia may be sitting in on their classes this semester.

An offspring of Accuracy in Media, conservative watchdogs who publicize alleged liberal tendencies in news media (and denounced *Science for the People* in their crusade), Accuracy in Academia claims that 10,000 "known Marxists" teach on college campuses.

Their leader, ex-Foreign Service officer Malcolm Lawrence, explained, "We're looking for political bias based on incorrect information." Accuracy in Academia wants to end what they see as the Marxist brainwashing of America's youth through "misinformation and disinformation" in schools.

By having volunteers, preferably senior citizens, sit in on political science, history and sociology classes, they will monitor professors and exert public pressure wherever they see liberal bias. Accuracy in Academia is targeting these fields because of the general perception that sociologists and anthropologists are furthest left politically, with political

scientists center-left, economists center-right, and physical scientists and engineers furthest right.

But they're really more interested in perspectives that link economics and politics than information. "It sounds like intellectual goon squads," Thomas Mann, executive director of the American Political Science Association, said. "They have in mind intimidation, inhibiting people from exercising certain points of view." According to Ernst Benjamin, general secretary of the American Association of University Professors, "They seem to be trying to frighten faculty members into supporting their obviously right-wing point of view. It is not only frightening, it is reprehensible."

Accuracy in Media's August newsletter named University of California professor and filmmaker Saul Landau, and University of Maryland professor and author Bertell Ollman as purveyors of disinformation. When we find out who else is on their hit list, we'll let you know.

—information from
The Washington Post

Created Equal

Good news in the fight against creationism: all new science textbooks proposed for next year's seventh and eighth graders in California's public schools have been rejected by the state's school board for failing to give adequate explanation of evolution and for being too deferential to creationism.

California's school board voted unanimously this fall to demand that junior high school science textbooks be rewritten. Says Bill Honig, who led the fight on the board, "We're saying

to the publishers, "Look, you may be worried about what special interest groups think of the books, but you've got to worry about the main event." Honig claims that the publishers have tried to "duck controversy" by watering down the words they use to describe evolution.

We hope that other states have the political will to follow suit and stop pandering to the fundamentalist special interests that keep trying to give education a bad name.

—information from *Science*



Eggs In Space

"Thirty-two chicken eggs, cradled in a special incubator that will carry a like number of eggs into space on January 22, 1986, have survived a simulated space shuttle launch without a crack or a scramble." That's the word from Kentucky Fried Chicken, who's funding the experiment.

The eggs will fly on NASA's space shuttle, the Challenger. "We hope this will give us valuable data about embryo development under zero-gravity conditions," explains John Vellinger, the mechanical engineering student from Purdue, who's conducting the experiment. "This can help us determine if other animals, and even humans, can reproduce in a weightless environment."

And why would they want to? Perhaps NASA is preparing to send selected survivors of a nuclear war into space. Then Reagan's grandchildren, and those chosen to sit out the holocaust in radiation-proof bunkers, can colonize the human race in space.

Or maybe Kentucky Fried Chicken is just angling for the first franchise on the Moon.

The Inevitability of Bhopal

by Michael Curry

It has been a year since the tragedy at Bhopal, and throughout that year, fed by further incidents involving Union Carbide, we continued to hear about its consequences.

We have received careful explanations of why the gas leak occurred, and why it was merely an accident. Some have proposed that the mechanical systems ought to have been better designed. Others have stressed that the people running the plant should have been better trained. Industry and press reports complained that locals should have been required to take the reasonable step of living farther away from an obviously dangerous place.

Whether avoidable by stricter safety standards or better land use planning, or caused by a random piece of bad luck, the accident, we have been told, was an *accident*. It was the result of a failure of the system, but of a system that was, and is, fundamentally sound.

Unfortunately, this view fails to comprehend the real lesson of Bhopal, which is its inevitability. As a natural consequence of this industrial system, Bhopal shows us that the system may not be so sound after all. Indeed, the disaster in Bhopal arises from the very existence of the plant. And the existence of the plant arises from the adoption—by the Indian government, by Western development agencies, and by multinational corporations—of a particular view of third-world problems and their possible solutions.

These views constitute an ideology of development which is composed of beliefs about the nature of the economic and social forces that affect the Third World. Consequences of this ideology are expressed in

Michael Curry teaches geography at Chicago State University and helped plan this issue of Science for the People.

population pressures, the means for the resolution of those pressures, the nature of agricultural development, and, ultimately, the nature of the environment itself. If its current expression in discussions of the Third World is new, the ideology has deep roots. It is founded in the philosophical, scientific, economic, and technological revolutions of the past three hundred years that have transformed life, first in Europe, and then around the globe.

The
Green
Revolution
was
greeted
enthusiastically
by western
corporations.

Underlying this ideology is the view that the process of "development" proceeds in a unilinear fashion through which all countries must proceed if suffering is to be lessened. Here the West is the model: a way of life based on subsistence agriculture, where initially large families were shrunk through disease and malnutrition, was replaced by a way of life based on industry, where agriculture itself became an industry, and where the problems of disease and malnutrition were solved through the application of industrial methods.

If this model more or less describes the path taken in the West, problems arise as we attempt to transplant it

to other countries. In India, for example, years of colonial rule had allowed the population to grow rapidly, while preventing the development of strategies for resolving the problem. People were offered images of consumption and development without being given the means for attaining them. As a result, the problems that India faces today are far more pronounced than those that the West faced at a similar stage of development.

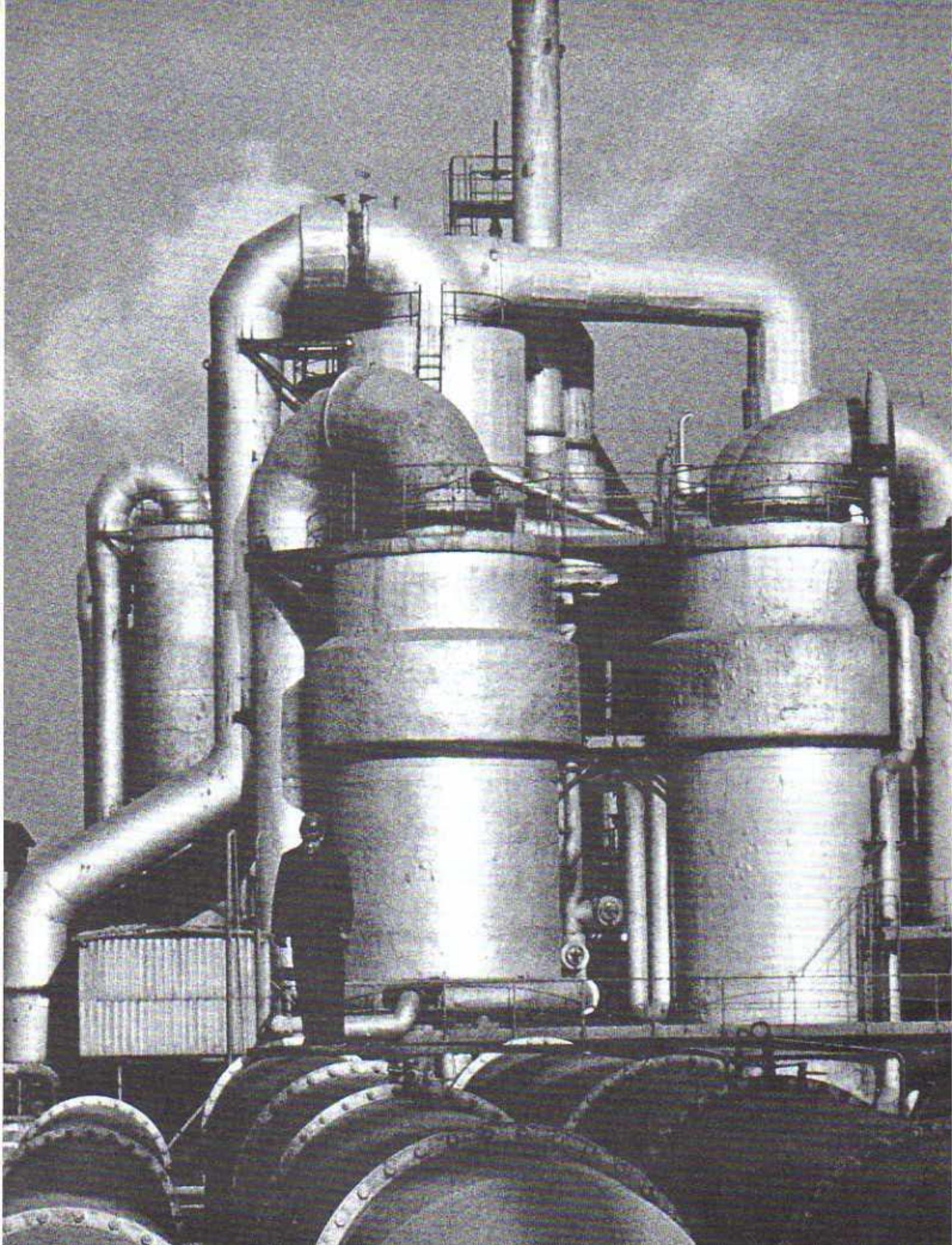
In the 1960s a solution was offered, one that seemed to promise a way of rapidly moving from the past to the present. That solution, a new means of increasing agricultural productivity, was the Green Revolution. Its very name seemed benign: who could reject a revolution that was the color of growth?

But in fact, the revolution had another color, and its color was Bhopal. For the Green Revolution was based not so much on ecological changes, although those were surely involved, but rather on the rapid development of an industrial infrastructure to support those ecological changes. By themselves, the ecological changes were of little significance.

Unlike other attempts to resolve third-world population problems—through land reform or alternative technology, for example—the Green Revolution was greeted enthusiastically by Western corporations, for it promised a rapid push of massive areas of land, and populations, into a more "solid" economic position. It promised new and larger markets as well as expanded, and inexpensive, sources of labor.

In the name of revolution, seed stocks once passed down from generation to generation were now purchased every year from multinational corporations, since the high-yield hybrids produced no fertile seeds. And herbicides, pesticides, and fertilizers began to replace human labor. Without them, it was argued, yields would be significantly reduced.

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ACCOUNTABILITY IS BAD FOR BUSINESS

Multinationals, Indian Industrialists And Government

by A. Vaidyanathan

Balance Their Books

Like the deadly chemical leak at Bhopal last year, most serious industrial and environmental accidents occur in the Third World.

In December 1975 an explosion in a mine at Chasnala, India killed more than 500 people. And more than 1,000 were killed in Mexico in November 1984 when 80,000 barrels of natural gas exploded at a state-owned Pemex factory.

It is too easy to dismiss disasters like Bhopal as a tragic consequence of a large-scale chemical operation in a third-world country using western technology. This is to be regretted, since technological failure was not the only cause of the accident. The network of relationships that exist among the power multinationals, Indian capitalists and the state and central government in India should also be examined.

Who Controls Industry?

Indian companies are registered in India, and Indian businesses and private shareholders own more than 51% of the companies' shares. Most of the big businesses in India's private sector are controlled by a handful of families, including Tatas, Birlas, Dalmias, Modis, Goenkas, Singhanias, and Jains Rams. These family businesses seek foreign collaboration to purchase Western tech-

nology, instead of developing indigenous technology with the help of Indian scientists.

Rather than concentrating in one industry, Indian companies invest in any manufacturing activity with foreign corporations, as long as they can make huge profits. Indian industrialists manufacture everything from toothpaste to steel products with the help of foreign investment. For example, Birlas, the second largest industrial group in India, owns newspapers, textile mills, jute mills, synthetic fiber plants, paper mills, plantations, aluminum factories and car plants.

Foreign companies in India are defined under section 510 of the Companies Act of 1956 as joint stock companies incorporated abroad, but having a place of business in India. Most multinational companies operate with local top management, believing that only someone born in the local environment knows how to handle it.

Although the plant at Bhopal seemed to be a carbon copy of Union Carbide's West Virginia plant, Carbide owned only 51% of the shares in the

Indian factory. Union Carbide India also owns 13 other Indian factories in nine cities, ranking among the top 20 Indian companies in sales. The chairman of Union Carbide India Limited is Keshub Mahindra, who comes from the famous Mahindra family. Mahindra and Mahindra own a large number of factories in India. They manufacture Jeeps, chemicals, plastic materials and steel products.

Union Carbide plants in India, including Bhopal, operate on a turn-key basis, where qualified Indian scientists and technical professionals are employed simply as operators. Because they were not involved in the planning of chemical operations at the Bhopal plant, these technicians were not aware of the physical and chemical properties of the materials at the plant. This lack of information led plant managers to ignore smaller gas leaks and hazards prior to the tragedy last December. Those working at the plant did not realize the scale of danger.

Technical data and chemical information was revealed to Indian scientists after the fatal leak, when British and United States scientists visited the Bhopal site. The move to blame the disaster on the human errors of the plant operators is unfair. How can one blame the operators for their negligence and arrest them if they are not aware of the technical details of the plant they are running and the chemical behavior of the gases they are dealing with?

Along with Union Carbide, the state government has much to answer

Dr. A. Vaidyanathan sent StP this article from Milton Keynes, U.K.

for. As reported in *India Today*, interviews with survivors indicate that none of them had any notion that they were living a road-width from disaster. Said one survivor, "I did not feel concerned. If the government permitted the factory, they must have made sure of it." This was a common reaction, and it explains why, beneath the fear and anguish that characterize the popu-

lar mood in Bhopal, anger is swelling against local authorities.

Early Warnings

The government was aware of hazards at the Bhopal plant. The administrator of the Bhopal Municipal Corporation issued a notice in 1975 to move Union Carbide's factory outside the city, because of its

In Institute, West Virginia:

Choosing Between Jobs and Health

On the first anniversary of the tragedy in Bhopal, its significance for the U.S. is becoming clear, but what to do about industrial chemical hazards is far from resolved.

The message of Bhopal is that the chemical industry is dangerous, out of control, and must be regulated. But in Institute, West Virginia, where Union Carbide operates a facility identical to its factory in Bhopal—and at 200 chemical plants owned by other corporations—apathy, old fashioned politics and economic determinism point the other way: no regulation, no concessions, no protection.

On a recent visit to Institute, I spoke with the former manager of the Institute Union Carbide plant, a staff member of the Virginia legislature who handles environmental issues for the House of Representatives, and some concerned activists. The three groups disagreed about the way things ought to be, but they did not appear to have very different views about how they are.

In Institute, it is common knowledge that the trade-offs are simple: you choose between your jobs or your health. One reason for this view is that Union Carbide has let it be known that they might have to move to a more conducive location if Virginia doesn't want its plants. In a desperate economy, that is a potent argument for a hands-off policy. And Union Carbide is not the only company that can say, "take it or leave it," to the citizens of Institute. Diamond Shamrock, Dupont, FMC, Monsanto, and other large corporations all have plants nearby.

While a good right-to-know law was implemented recently, no more comprehensive legislation appears possible, either at the state or local level, unless a major accident happens

in the near future. For instance, when Union Carbide wanted to restart its methyl isocyanate plant last spring, there was no agency with the desire or clout necessary to say "no," in spite of the fears of its neighbors—some living just outside the gate.

And disastrous spills are not the only cause of concern for the citizens of the Kanawha Valley, where Institute is located. Even at best, in the absence of an accident, the chemical industry in the valley is slowly poisoning its inhabitants. Perry Bryant, environmental coordinator of West Virginia Citizens Action Group, estimates that the chemical industry of the area annually emits over 10,000 tons of chemicals, including many carcinogens.

In such a political environment, however, Union Carbide and the rest of the chemical industry need not worry about legislative restrictions or public protest. "A lot of people are not concerned here," said a Carbide spokesman. "People have lived with the chemical industry for many years."

But is the trade-off really that stark? Must the people of Institute continue to live in fear of their health to protect their livelihood? Unfortunately, neither activists such as Bryant nor the state legislature have come up with viable alternatives. The unfounded belief that there are no other choices, however, hangs as oppressively in the air as the foul pollution.

The citizens of Institute are hostages, not only to the chemical industry, but also to a myth which is accepted without evidence, even by those who have the least to gain from it. Until they question the fiction that they can't have both jobs and health, they will unwittingly trade their health for chemical industry profits. And since Institute is in some sense a microcosm of the rest of the country, it behooves every one of us to reexamine these myths. If we don't, we will someday discover ourselves just as imprisoned by them as the citizens of Institute are today.

—Dan Grossman

proximity to the city's population, and he was transferred. According to *India Today*, the state government revealed that there had been at least three previous accidents—in October and December 1982 and February 1983—of leaking chemicals and gases. Ashraf Khan, a Carbide worker involved in one accident, died from exposure to phosgene gas that was an ingredient in pesticide production at the plant.

Referring to these accidents, the chief secretary of the state government told *India Today* that they provided no pattern or warning of catastrophe. "I am quite clear," he said, "that none of the earlier accidents could lead anyone to anticipate that this (the large-scale leak of MIC) would happen."

Other, far more ominous indicators did point to danger. A report prepared in May 1982 by three American experts from Union Carbide was startlingly critical of operations at the Bhopal plant. "The plant represented either a higher potential for a serious accident," they stated, "or far more serious consequences if an accident should occur." They outlined a clear warning:

1. Filter cleaning operations are performed without slip binding process lines. Leaking valves could create serious exposures during this process.
2. Leaking valves have been fairly common. A considerable number of valves were replaced in March 1982 but the problem still exists though to a lesser degree.... Team members observed one case in which a MIC shutoff valve was leaking so severely that even evacuation of the line above the valve was not adequate to prevent MIC release when a blind flange was removed.
3. A number of factors make the MIC feed tank at Sevin (the pesticide plant) a source of concern...it is possible to contaminate the tank with material from the vent gas scrubber.
4. The pressure gauge on the phosgene tank was bad, showing no pressure even though the tank was in service.

The report and accompanying recommendations were sent to the Bhopal management in September 1982, but it is a matter of controversy as to how far the suggestions were implemented. The state labor department did not enforce these recommendations after the death of Ashraf Khan.

Authorities are ill-equipped to make proper inspections. The Indore-based director of industrial health and safety has two deputies, one at Indore and one at Bhopal, and about

two dozen inspectors for the entire state of Madhya Pradesh, covering 442,841 square miles, with a population of more than 45 million. According to *India Today*, one Carbide source said that in all his years, he never saw an inspector seriously check the plant and machinery. "All the inspection meant was signing forms that everything was alright," he said.

The chief secretary to the Madhya Pradesh agrees that the state governments are not equipped to formulate regulations and carry out proper inspections. They lack the know-how and relevant instruments to check gas emissions. Ironically, at the time of the Bhopal accident, the central insecticides board, which registers all pesticides and declares them fit for use, was reviewing a list of 25 highly toxic pesticides it was planning to repudiate. The list included carbaryl, which is marketed as Sevin, and Aldocarb, two MIC-based pesticides made by Union Carbide.

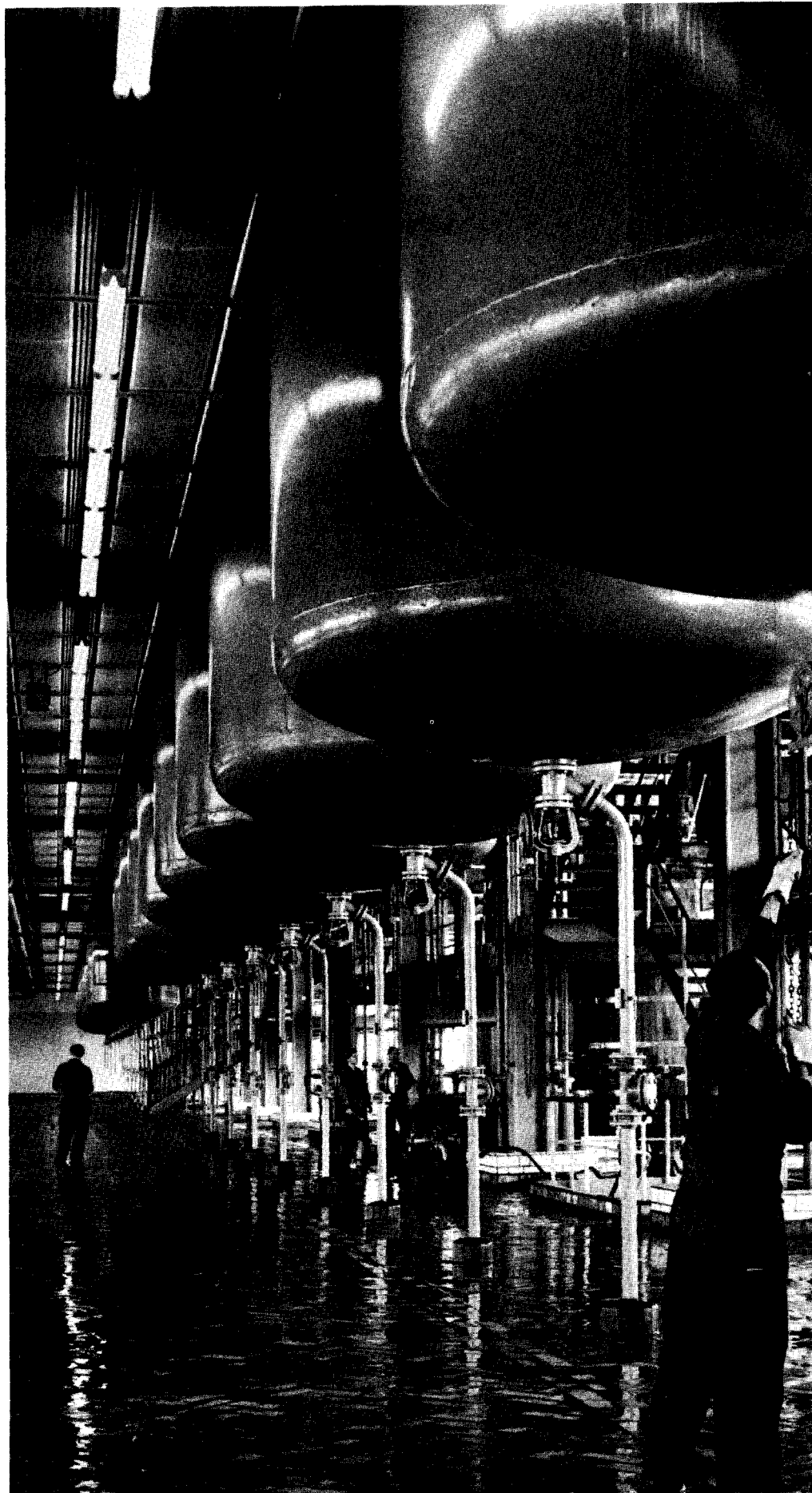
Standard Operating Procedures

In the wake of the Bhopal disaster, the Indian government may talk about safety precautions at plants which use or produce dangerous chemicals, but the prospect of such steps actually being implemented by the industry and enforced by the government is very remote. The present political and economic system in India allows foreign and Indian companies to operate dangerous plants in densely populated urban areas.

In public sector enterprises, the majority of the shares are held by the Indian government, and the rest are owned by a foreign company which provides the technical know-how. There is a public sector insecticide factory in Delhi and a petrochemical plant using hydrogen cyanide in the center of Baroda, and both of these operations are considered safe by the Indian government.

Within a radius of five miles, two refineries, one fertilizer plant, one caustic soda plant and the Trombay Atomic Energy Establishment nuclear reactor, in addition to a large number of small chemical and engineering factories, are situated in Trombay, Bombay. The strong smell of ammonia from the chemical plants in this area is very obvious, but the state and central government have not taken steps to stop this atmospheric pollution. The refineries, the

continued on page 29



SECRECY WAS BHOPAL'S REAL DISASTER

Why Was Information Hidden from the Public?

by Meera Nanda

What killed more than two thousand people in Bhopal, India in December of 1984 and left many thousands more suffering, perhaps for the rest of their lives?

Ostensibly, 40,000 kilograms of the toxic methyl isocyanate (MIC) gas caused this disaster, bursting out of a storage tank in Union Carbide's pesticide plant and settling over the neighboring crowded slums. The gas was indeed extremely toxic, asphyxiating people, animals, and plants to a painful and fast death. But MIC was only the more visible and immediate cause of the disaster.

Equally disastrous, though less tangible, was the closed door policy of Union Carbide and civil authorities while dealing with the crisis. Secrecy, officialdom, and disinformation—often deliberate—greatly contributed to the manufactured tragedy that befell Bhopal.

"The right to know is like the right to life," wrote Bernard Shaw. "It is fundamental and unconditional in its assumption that knowledge, like life, is a desirable thing." The right to life, the most basic of all human rights, was violated in Bhopal because people were denied relevant and timely information. The state compromised the lives of Bhopal's citizens, first by permitting a particularly hazardous industrial process to operate within city limits, and later by withholding information about the chemical nature and toxicity of the gas, its effects on human body and environment, and the proper line of treatment. Bhopal is not merely the worst industrial disaster in history but also the worst instance of an information black-out in a crisis situation in modern times.

No Siren, No Signal

The city was asleep when, on the fateful night of December 2, 1984, a MIC storage tank in Union Carbide's plant discharged its load of poison into the chill winter air. A slight south-southeasterly breeze wafted the cloud towards the railway station and shanty colonies of industrial laborers, construction workers, rickshaw pullers and vendors of vegetables. The heavier-

Meera Nanda holds a doctorate in biotechnology and works as a science correspondent for Indian Express in Delhi.

than-air gas silently settled over an area of about 40 square kilometers around the plant.

No siren, no signal warned the sleeping residents of their impending death. The factory alarm was sounded a full three hours after the leak was detected at around 11:30 PM. Many never woke up. Others awoke, gasping for air in the choking fumes of the gas that was searing their lungs and burning their eyes.

Panic gripped the people. In a desperate bid to escape from the invisible noose around them, an exodus began. Clutching their children, a blinded, gasping, bewildered people fled their homes. Hoping to get onto a train, many ran to the railway station barely two kilometers from town, only to join the dead passengers, porters and railway staff. On bicycles and bullock carts, in buses, trucks and cars they fled. The poor ran on foot and the faster they ran, the quicker they fell.

While the pathetic stampede for life was on, there was only a deafening silence from Union Carbide. Neither the civil authorities nor the police received any information about the accident from plant officials. Repeated attempts by the superintendent of police to obtain some information about the leak, the nature of the poison, and ways to protect the stampeding crowd drew a blank. Union Carbide's stock reply to all queries that night remained, "Everything is under control," or "No one knows what has happened."

Information Blackout

A month later, Dr. S. Vardhajan, director of the Council of Scientific and Industrial Research (CSIR), who officiated over the neutralization of the remaining MIC stock, remarked that people died in such large numbers because they did the wrong things when exposed to the gas. Scientists now think that

While the
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victims unwittingly courted death by opening the windows to let some air in, and by running.

They should have stayed indoors, with wet towels wrapped around their faces. Such simple precautions could have saved lives, if only this advice had been made available to people at the time of the disaster. As it was, they were caught totally unaware and received no information about what to do. By trying to flee, they did what their primeval instinct for survival impelled them to do—and died in the process.

When the sun dawned on the poisoned city, over 500 lay dead on the roads, along with carcasses of animals. Over 2,000 lay dying in hospitals and homes. Thousands began a weary trek to hospitals. The outpatient department of Hamidia hospital at the Gandhi Medical College registered a figure well above 12,000 that day.

Then Union Carbide began a process of deliberate disinformation and suppression of facts. Strangely, India's own scientists and officials also adopted a curious strategy of withholding vital information from people, the press, voluntary organizations and even their own medical teams. The ridiculous limits to which secrecy was carried is evident from the declaration of even the weather data (wind speed and humidity) of Bhopal on the day of the accident as classified.

Overwhelmed by the tremendous rush of the dying and the dead, doctors contacted experts at Union Carbide for medical information about the gas. Dr. Loia, medical



Andrew Joslin

officer at Carbide, advised them not to worry since the gas "was only a powerful irritant, but not lethal." With mortuaries packed with corpses, this was clearly a most irresponsible, misleading lie. What is worse, Union Carbide let such obvious disinformation spread while in full possession of facts that should have made it fear the worst.

Carbide's own safety manuals put the threshold limit value of MIC at 0.02, or one fiftieth part per million (ppm) implying that beyond this concentration in the atmosphere, MIC becomes dangerous. This makes MIC a much more potent poison than toxics like phosgene and hydrocyanic acid, which can be tolerated up to 0.1 and 10 ppm respectively.

Naming the Killer

For days after the accident, not more than a handful of doctors in Bhopal knew that the gas was MIC or believed that it could kill. Toxicological manuals had scant information about the gas, and Carbide's doctors assured them that MIC was not lethal and had no long-term consequences. So scientists assumed that phosgene, another hazardous gas used for the production of MIC, had poisoned Bhopal.

The theory seemed plausible because phosgene, the notorious gas used by the Germans in World War I, was a known killer and some of its symptoms resemble those produced by MIC. Also, with a boiling point of 39 degrees centigrade, the liquid MIC could not have vaporized when the ambient temperature was as low as 14

degrees. Phosgene, however, turns into gas at temperatures as low as eight degrees centigrade. This neat reasoning in favor of phosgene fell to pieces when, much later, it was revealed that due to the accidental seepage of water into the tank, some MIC had polymerized, releasing enough heat to vaporize the remaining 40 tons of liquid MIC. The doctors finally settled on MIC as the culprit, but only after considerable time and effort had been wasted.

The controversy had important medical implications. Not knowing exactly what they were up against, doctors could only offer symptomatic treatment: atropine and steroids for eyes, bronchodilators and steroids for lungs, and antibiotics. Attempts by some toxicologists to use an antidote to detoxify the poison and prevent long-term effects were lost in the controversy.

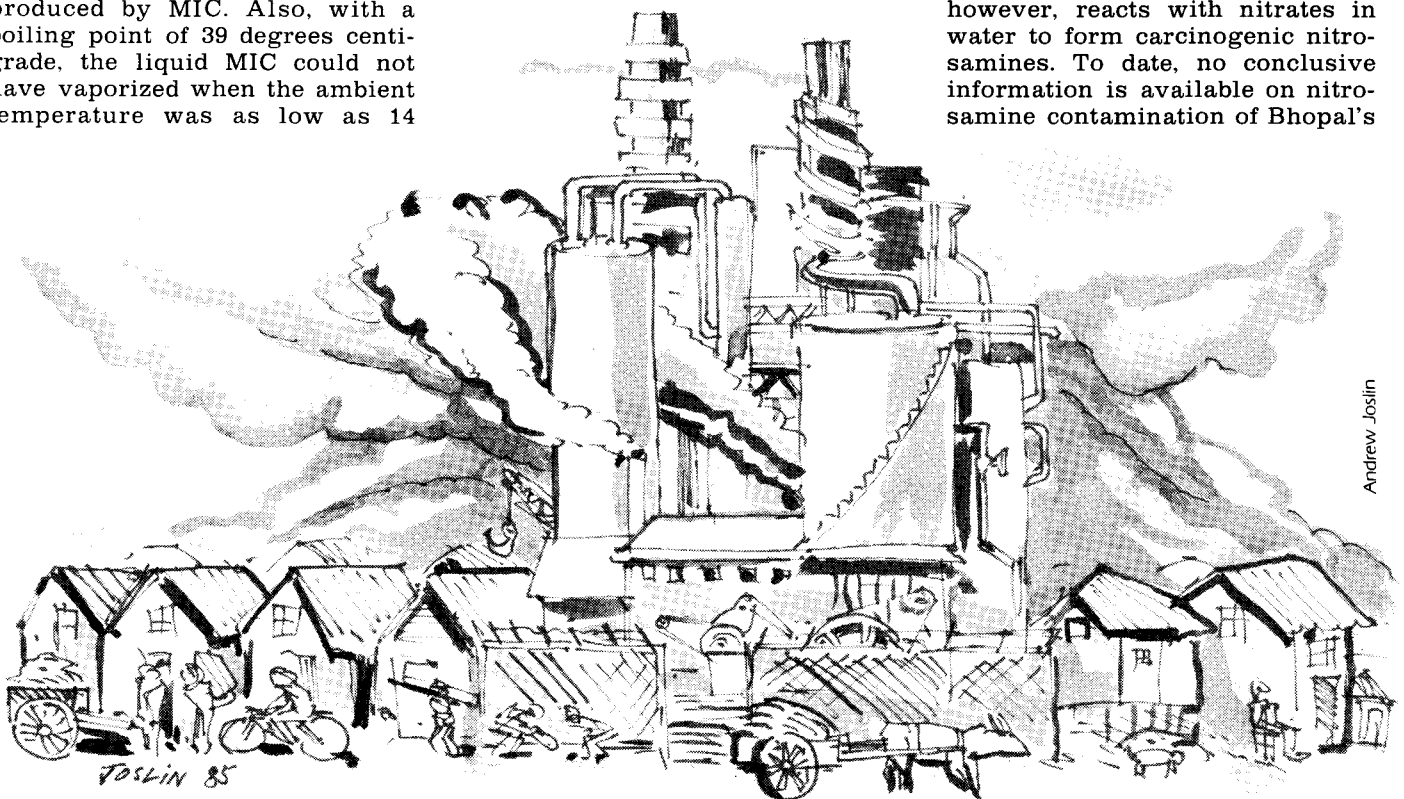
That so much confusion could prevail over the name of the poison is itself a telling example of the information blackout in those terrible days. Union Carbide officials had pleaded ignorance about medical aspects of MIC, but surely they must have been aware of what raw materials they were using and storing in their plant. In full possession of relevant information, Union Carbide again chose to remain tight-lipped, allowing the controversy to fester.

Retrospectively, the government could have put an end to this most unnecessary debate by obtaining information from Union Carbide and making public the exact composition and amounts of gases stored in that ill-fated tank. But the government kept quiet until December 21, when Dr. Vardhajan, disclosed for the first time that a small amount of phosgene was present in the MIC tank.

Aftermath of the Disaster

Meanwhile, what happened to the survivors back in the gas-affected areas? The gas had left visible signs of devastation. All trees, shrubs, and vegetable crops had shed their leaves overnight and stood as if scorched. Dead fish floated in lakes. But even while the samples of air, water, and food were being collected for analysis in Delhi and Lucknow, the environment was declared safe by the Prime Minister, who visited Bhopal on December 4th, the day after the disaster. People were far from convinced, especially after they found out that those making such reassuring statements were getting all of their supplies, including drinking water, from places far away from Bhopal.

Complete analytic results, including the breakdown products of MIC, were never disclosed. MIC is known to react with water to produce methyl amine and dimethyl urea, the latter of which is harmless. Methyl amine, however, reacts with nitrates in water to form carcinogenic nitrosamines. To date, no conclusive information is available on nitrosamine contamination of Bhopal's



Andrew Joslin



water. If this has been tested at all, the results have never reached the people.

Why was the use of sodium thiosulfate, a cyanide antidote, officially discouraged? Right from the first day, Dr. Hareesh Chandra, head of the forensic medicine and toxicology department of Hamidia hospital, had suspected cyanide poisoning in the victims. Bright red and thickened blood, difficulty in distinguishing venous from arterial blood, labored abdominal breathing of survivors and some autopsy findings pointed to death by cyanide. Dr. Chandra recommended that sodium thiosulfate be administered immediately. The idea was turned down for lack of "conclusive evidence" and "rigorous analysis" to identify the toxic element.

It was not until a German toxicologist, Dr. Daunderer, arrived that thiosulfate was first tried on patients on December 8th. The initial results were promising. But then came a statement from Union Carbide asserting that MIC degraded to only harmless products in the body, and that production of cyanide, which is very different from the isocyanate in MIC, was impossible. Based on that statement, use of thiosulfate was officially declared unnecessary on December 13th. The only really effective line of treatment was thus stopped. This is difficult to believe, but it happened.

In the first week of February 1985, two full months after the tragedy, doctors reconsidered use of the anti-toxin. Dr. Chandra's treatment of 40 patients under control conditions since January 20th proved thiosulfate's efficacy. Meanwhile, research had shown that thiosulfate increased the excretion of thioisocyanate, indicating the removal of isocyanate radical that apparently had bound to hemoglobin, preventing oxygen exchange. Scientists had found their "conclusive evidence," but many lives too late.

The entire history of medical relief during and after the crisis remains riddled with secrecy. No uniform guidelines about the treatment were ever issued to doctors. Depending upon their predilections and ethics,

doctors kept prescribing steroids, eye drops, and antibiotics in varying doses.

Curiously, the Indian Council of Medical Research, the government agency coordinating all medical research into MIC, issued strict orders to all doctors, including private practitioners and research teams, not to disclose their findings to the press or the people. Postmortem results and case histories were declared classified. Having no access to medical records, junior doctors did not even know what organs, besides eyes and lungs, needed investigation and treatment. Small wonder, then, that those already

treated kept returning with severe complaints ranging from coma to jaundice and gastritis.

Women suffered worst, especially those pregnant at the time of the accident. Around 112 spontaneous abortions had been recorded in the city's major women's hospital three months after the gas leak. Doctors working with *Zahreeli Gas Kand Morcha*—a group of peoples' science movements and civil liberties activists, doctors, lawyers, and scientists demanding correct information, medical relief and compensation for the disaster—found through an independent study that many pregnant women experienced decreased fetal move-

Diary of Disaster

Nov. 19, 1984, Mexico City. Liquid gas storage tanks exploded at the Petroleos Mexicanos site, killing 452 people and injuring 4,248. About 1,000 people were reported missing.

Feb. 25, 1984, Cubatao, Brazil. An explosion and fire caused by gasoline leaking from a pipeline killed at least 500 people.

July 11, 1978, San Carlos de la Rapita, Spain. A 38-ton truck carrying propylene gas overturned, sending 100-foot flames into a campsite filled with almost 800 vacationers, and killing 215 people.

July 10, 1976, Seveso, Italy. Up to 22 pounds of toxic dioxin leaked into the atmosphere after a chemical explosion at the Hoffman-La Roche plant. More than 4,500 acres and 1,000 people were affected.

December 1975, Chasnala, India. A coal mine explosion killed 431 coal miners.

June 1, 1974, Flixborough on Humberside, England. A pipe ruptured at the Nypro Ltd. caprolactum chemical plant. The explosion killed 28 workers and destroyed all buildings on the 60 acre site.

November, 1968, Farmington, West Virginia. An explosion in the Number 9 Consol Mine killed 78 miners.

1956, Columbia. A dynamite truck explosion killed about 1,100 people.

July 28, 1948, Ludwigshafen, Germany. A railway car carrying dimethyl ether to the I.G. Farben chemical plant exploded inside the factory gates, killing 207 and injuring about 4,000 people.

April 16, 1947, Texas City, Texas. A freighter carrying 1,400 tons of ammonia fertilizer caught fire and exploded, and another ship carrying nitrate exploded in Texas City's harbor. Flames spread to Monsanto's synthetic rubber factory, fanning fire throughout the city, killing 576 people and seriously injuring over 2,000 others.

Oct. 20, 1944, Cleveland, Ohio. A liquid gas tank exploded at the East Ohio Gas Company, causing a blast and fire that killed 131 people.

1942, China. An explosion in the Honerick coal mine killed at least 1500 miners.

Sept. 21, 1921, Oppau, Germany. A chemical explosion occurred when workers used dynamite to force loose a 4,000 ton block of ammonium nitrate fertilizer. The blast destroyed buildings four miles away and killed 561 people.

December 1907, Monongah, West Virginia. A coal mine explosion killed at least 361 miners.

Information from *No Place to Run*, published by the Highlander Center and Society for Participatory Research in Asia, and from *Time*, December 17, 1984.



ment and others suffered from suppression of lactation, polymenhorrea (frequent menstrual cycles), inflamed pelvic regions, and abnormally high vaginal discharge.

Pregnant women were exposed to toxic gas, hypoxia, stress, and drugs, each of which can cause damage to the fetus. Under these circumstances, ultrasonographic tests and amniocentesis should have been used. Information about the risks should have been given to women so that they could exercise their choice of terminating pregnancy within a period when abortion is safe. Medical termination of pregnancy is legal in India, and every woman has a right to it if she so desires.

But information was not forthcoming. Pregnant women still carrying their babies in the weeks and months after the accident had little or no idea of the possible risks. No tests were done to check fetal growth. Doctors merely kept pregnant women under observation. Perhaps they were looking for "definite proof" that MIC affects the fetus.

Why So Much Secrecy?

Union Carbide's attempt to hide facts and play down the extent of damage, though reprehensible, is at least understandable—they had obvious vested interests to protect. But why should the state neglect the interests of people? Although the government often appeared willing to tow Union Carbide's line, there was no conspiracy. The state and central government mobilized all possible resources to cope with the crisis. With general elections around the corner, there were instances of making political capital out of the tragedy and of corruption, but the relief operation was well intentioned and reasonably effective.

What caused the breakdown of communication between civil authorities, scientists, doctors, volunteer groups, and the affected people? First, the administration had never visualized such a contingency. So low is the importance given to environmental issues in India that the state government, in 1975, permitted the hazardous plant to oper-

ate within city limits, even though it violated the city plan which requires obnoxious industries to be located in an industrial zone 15 miles away. In spite of warnings in the press, workers' agitation for more safety, and questions in the parliament, Union Carbide was allowed to continue production of pesticides in the middle of the city.

Emergency plans for a possible emission accident were never rudimentary emergency drills and public education about possible hazards simply did not exist. In fact, it was only after the accident that many residents of Bhopal realized for the first time that Union Carbide was making pesticides and not batteries, as they always thought.

The later embargo on information stemmed, in part, from an arrogant contempt of the lay public by the so-called experts. It was not considered in the public's interest to explain what exactly had happened and what the likely consequences would be, on the assumption that it would create panic.

The press, which could have been a mediator between experts and the

people, was shunned on the charge of sensationalism. As a result, rumors spread and people had no source of authoritative advice. For instance, when the left-over MIC was neutralized from December 16-21, there was another mass exodus which even the patients from hospitals joined, expressing their total lack of faith in this so-called Operation Faith, in spite of assurances that the process was entirely free from risks. In the year since the gruesome accident, rumors are still rife that there will soon be another, even bigger "explosion" in the plant that will wipe out the entire city.

Even vital information like the effect of gas on fetuses and general health was hidden from the people, presuming that because many of them are illiterate they would not understand. But people's science groups have successfully taken the initiative to explain scientific details to the people in gas-affected colonies through illustrations and models on street corners, in makeshift classes. Most people, especially the women, have been eager to learn about the disaster.

APHA Forms Working Group on Bhopal Disaster

Following the catastrophic gas leak in Bhopal, India, the worst industrial accident in history, the Program Development Board of the American Public Health Association (APHA) has convened a working group to review the public health implications of the disaster.

In a report presented at APHA's November 1985 annual meeting in Washington, DC, the working group outlined a series of issues arising out of consideration of the Bhopal incident. These issues, they point out, have important implications for development in the Third World, as well as for the management and

regulation of hazardous chemical facilities in industrialized nations.

The issues they discuss include the export of hazard to developing nations, the international double standard in safety regulations, and the need for right-to-know and right-to-act statutes. The report also examines the green revolution and agricultural chemicals, the siting of hazardous chemical facilities and the inadequacy of current risk assessment methodologies for estimating the risk of rare but catastrophic events.

The group proposes a series of strategies for preventing a recurrence of the Bhopal incident and for creating a more stringent safety standard for hazardous industries, and develops the concept of "certified environmental auditors". Copies of the report may be obtained from Dr. Charles Levenstein, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

The information they have received has caused many to ask more questions about the first aid they got. They are no longer prepared to ascribe their breathlessness, dizziness, and hazy vision to their earlier ailments, as doctors have been telling them. They are demanding better checkups and abortion facilities. Perhaps this is what the government wanted to avoid by withholding information from them.

In addition, the scientific community also responded in a bureaucratic fashion, perhaps because they want to evade responsibility. The Indian Council of Medical Research's ban on disclosure of all findings, suppression of perfectly innocuous information like the weather, and secrecy about the nature of the gas all fall into this pattern. Orders from above and high level inquiries so easily silenced scientists who had information.

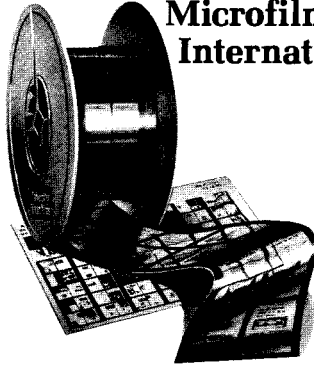
Most difficult to understand remains the official attitude towards thiosulfate treatment. Banning its use when it could have saved lives is no less than a criminal offense on the part of scientists and decision makers. On what basis, one wonders, did our scientists accept the word of Union Carbide—the same company that earlier pleaded complete ignorance of medical effects of MIC, in spite of enough evidence pointing to the opposite?

Perhaps the answer lies in their unshakable faith in foreign expertise. Baseless assurances from World Health Organization officials and Union Carbide doctors carry more weight than evidence at hand. These same scientists wanted a conclusive, scientifically correct proof, while their own attitudes remained so blatantly unscientific.

Perhaps India did not want to make trouble for a multinational, because that would discourage future foreign investment. It suited Union Carbide to disprove cyanide poisoning due to MIC, a chemical of obvious economic importance to the company. And the Indian government obliged, even at the cost of the lives of its citizens.

The holocaust at Bhopal has initiated a new chapter in the evolution of people's science, environmental health and civil rights movements in India. It has shown how all these issues are united and need to be fought for from a common platform. People's right to know has to be safeguarded so that their right to life is not threatened by such disasters ever again.

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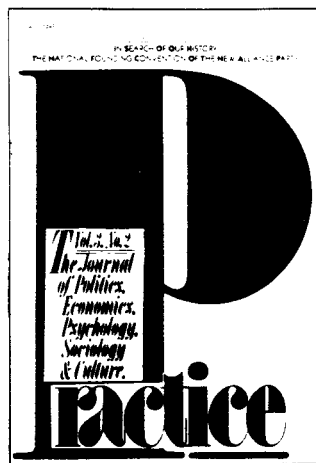
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URBAN THIRD WORLD CHILDREN

Toxic Exposure and Malnutrition

by James Hebert and Jane Teas

In light of the chemical disaster in Bhopal, it is appropriate to consider a closely related but much more widespread problem. Though Bhopal was a spectacular example of a systemic failure on a grand scale, most exposures to toxic chemicals—solvents, hydrocarbons, oxidants, and heavy metals—are chronic, not acute. These chronic exposures are poorly understood in terms of extent and consequence, but the subgroup of the population most at risk from toxic materials exposure is malnourished children.

The overwhelming evidence is that malnutrition and toxic exposures are not distributed independently with respect to each other. Malnutrition occurs in an environmental context determined by social, cultural, economic, and political factors. These same factors also influence the probability of toxic environmental exposures.

This reality raises two very relevant questions. First, what is the

James Hebert works as a nutritional epidemiologist for the American Health Foundation. Jane Teas is toxics coordinator for the Northeastern States for Coordinated Air Use Management and the New England Interstate Water Pollution Control Commission.

biological relationship between malnutrition and exposure to toxic chemicals? There is strong laboratory evidence linking poor nutrition with exacerbation of toxic effects. However, with the exception of lead exposure, there has been very little epidemiological work relating increased toxicity to age and/or nutritional status. Recognizing the poor and scanty data with which we can answer this question, the World Health Organization recommends additional study.¹

Furthermore, what are the forces that determine the likelihood of malnutrition and the probability of exposure to toxic agents? This second question is much more difficult to answer.

Overview of Third World Urbanization and Industrialization

Though most of the Third World is now rural, this situation is rapidly changing. Among the 34 poorest countries of the world, urbanization is occurring at 180%, the rate of overall growth of the population. The mid-1982 population of this "group of 34," including China and India, was 2.3 billion people. More than 20% of the total population of these countries currently live in urban areas, up from 12% in 1960.

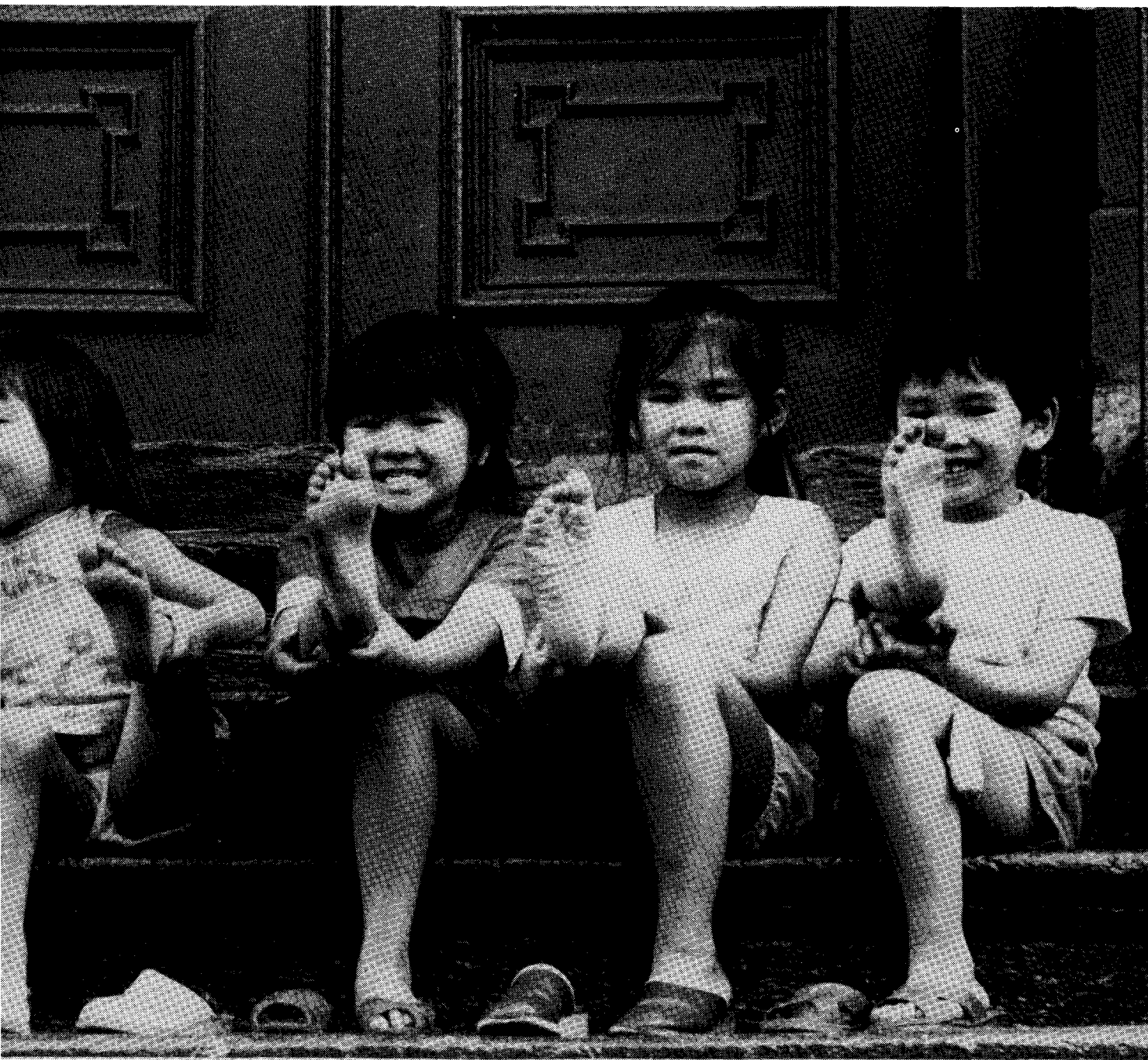


Approximately 70 million children under 4 years of age presently live in these urban environments.²

In countries that are urbanizing, industrialization is occurring at a more rapid rate. For example, in India from 1960 to 1980, production of dyes and pigments increased 20 fold, and production of pesticides increased 28 times. From 1950 to 1980, pharmaceutical production rose over 20 fold, caustic soda over 41 fold, organic chemicals over 120 fold, and fertilizers over 166 fold.³

Most of the industrialization that has taken place in the Third World has occurred in urban areas because of access to transportation, municipal facilities such as piped water and sewer connections, and an abundance of low-cost labor. This industrial development has contributed to overcrowding, and increased demand for such services as water and sewer connections. With rare exceptions, it has been a very haphazard, poorly planned, and poorly controlled process.

Industrialization has attracted foreign investment by multinational corporations, and inappropriate procedures—often banned in the developed countries—are frequently introduced. The motivation to proceed quickly with the industrialization process and to maximize profits has thwarted enactment of legislation to protect the environment and human health. The few existing laws are often not vigorously enforced.



Ellen Shub

Children, Malnutrition, Poverty, and Health

In the third-world context, malnutrition includes a broad spectrum of conditions mainly related to dietary deficiencies in macronutrients, such as protein and total calories, and micronutrients, such as minerals and vitamins. Over 30% of all children in the poorest countries suffer at least mild protein energy malnutrition. Many also suffer deficiencies of B-vitamins, vitamins A, C, and E, and minerals such as iron, selenium, and calcium.

Rarely does a child suffer from deficiency of an isolated nutrient in the diet. Not only are the distributions of available nutrients related to one another, but the absence of one may affect the mobilization of the other. This is the case when protein is limited and transport of vitamin A to tissues is compromised.

For the urban poor, health problems are in many ways more ser-

seldom have access to the means of producing their own food, and because sanitary conditions tend to be exacerbated by crowding. Many of these urban poor are "illegal" residents of the city. They do not own property or pay taxes, and they are ineligible to vote. In 1978 in Madras, India, about half of the city's population of over 3 million were unauthorized residents; that is, they had no legal access to water supply, sewage disposal, roads, housing, or medical care.⁷ For "illegal" residents, the likelihood of diseases related to poor nutrition or sanitation is higher than for the "official" urban population.

Nature of the Exposure

The urban poor are exposed to an array of chemical insults to which they are not equipped to respond because of malnutrition, infection, and general immunoincompetence. These exposures, mainly to by-products of industrial activity, may

Two pollutants produced by internal combustion engines, nitrogen dioxide and ozone, can irreversibly damage cell membranes and may even destroy whole organs, such as the liver or lungs.

How the Body Copes with the Exposures

The liver, lungs, and kidneys are organs critical in coping with the kinds of toxic compounds typically encountered in and around urban industrial areas. Because of their intimate exposure to the environment, the lungs are a first line of defense against many of the respirable compounds that are found in urban areas. The liver is the primary organ of detoxification and is extremely important in the digestion and processing of fats, fat-soluble vitamins, such as vitamins A and E, and other fat-soluble compounds. The kidneys play a central role in excretion and have intimate contact with lipid-soluble compounds, such as organic solvents, which are readily reabsorbed before excretion.

Damage to the liver and lungs has been reported in rats given chemicals such as DDT and endosulfan.⁸ Petroleum products may cause changes in total protein in the liver and kidney as well as changes in protein synthesis.⁹ This has profound implications for children who already have subclinical malnutrition.

Factors related to the tropical environment also exert an effect on the body's ability to cope with toxic exposure. Absorption of hydrocarbons through the skin is facilitated under conditions of increased temperature and humidity, with the worst problems to be expected among children, who have relatively high surface-to-volume ratios.

What Happens When a Malnourished Child Is Exposed?

Susceptibility of those people with dietary deficiencies has been acknowledged by the World Health Organization as being "a matter that will need to be monitored carefully."¹⁰ It is known that malnourished people are abnormally susceptible to pulmonary infection as well as to gastrointestinal disease.

Protein energy malnutrition (PEM), as well as deficiency of certain B-vitamins, can cause fatty infiltration of the liver. Of the 7% of all third-world children who have se-

Must we wait until there are enough dead bodies of children who have died of toxic exposures before we attempt to protect children from toxic agents in the environment?

ious than for their rural compatriots. Specifically, there are indications that urban malnutrition is an even more serious problem than rural malnutrition and a more difficult issue with which to deal institutionally.^{4, 5} For example, in studies done by the Indian Council of Medical Research, the hemoglobin levels of the poor urban population of Delhi were consistent with widespread anemia and were lower than for children living in rural areas. In addition, anthropometric indicators of the nutritional status of the urban poor were also lower through the very vulnerable first four years of life.⁶

These classic problems of malnutrition and infection typically related to poor diet and unsanitary living conditions are often worse in urban areas because city dwellers

be through air, water, or contact with solid waste.

Though over 55 million children under 15 years of age are exposed while working outside of their homes, there is a huge and poorly understood exposure through the nonoccupational environment which often is more heavily contaminated than the regulated workplaces of the West. In addition to urban industrial emissions, for example, smoke from cooking fires in the home is often a direct source of air pollution. This is due partly to the poor quality of available fuels and the lack of good ventilation from badly designed stoves.

With the number of motor vehicles in third-world cities increasing faster than the international average, emissions from motor transport also pose a serious health problem.

vere PEM,¹¹ liver function and its central role in metabolism and ridding the body of toxic substances are probably impaired.

Though there is an extensive literature on the effects of widely used industrial chemicals on laboratory animals, very little is known about occupational exposures in adult humans, and virtually nothing is known about exposures in the ambient environment or in children. Yet it is known that many organic solvents used for industrial purposes themselves produce fatty livers. In a recent study in India, exposures to toxic chemicals were cited as possible explanations for approximately 50% of patients with liver disease who did not have an identifiable infectious etiology.¹²

Presence of vitamin E helps to prevent damage to fragile cell membranes, especially in the liver and lungs. Diets typical of poor, urban third-world children would be expected to lack vitamin E, and levels of vitamin E necessary for protection may be much higher than even U.S. dietary levels. Yet what vitamin E there is in foods may be destroyed by exposure to oxidation, lead, iron salts, alkali, or ultraviolet (sun) light. Also, deficiency may occur where there are large environmental exposures to oxidants, such as nitrogen dioxide, that are not of dietary origin.

Direct nutrition effects are related to antioxidants or related factors in the diet. These include vitamins A, C, and E, and selenium. Though there are compensatory mechanisms within healthy organisms for certain organs, such as the lung, to acquire vitamin E from other organs, the poorly nourished are unable to compensate for selenium deficiency. It has also been shown that vitamin E deficient rats are much more susceptible to lung tissue damage.

Proteins, riboflavin, sulfur-containing amino acids, and total dietary calories are other factors indirectly related to detoxification. Inadequate calories may affect responsiveness to oxidant stress. It has been shown that red blood cells need certain levels of blood sugar (glucose) for the protective effect of selenium. The energy from food calories is also needed to provide fuel for other biochemical activities such as converting niacin to a form necessary for reactions to detoxify harmful chemicals.

Often, the presence of a nutrient in the diet will reduce the likelihood that a toxic agent will be absorbed.



Jane Teas

For the urban poor, health problems are more serious than for their rural compatriots.

This is an important fact for young children who not only eat too few calories but eat them infrequently. For example, it has been shown that increased calcium, iron or magnesium in a meal inhibits the absorption of toxic metals such as lead or cadmium.¹³ Even among healthy adults on short fasts, lead absorption was greatly increased relative to absorption during or shortly after eating.¹⁴ It is well known that lead interferes with the formation of hemoglobin, resulting in anemia. If dietary sources of iron are low, then absorption of lead is increased. Therefore, children who are exposed to lead and have poor dietary intakes of iron, which is usually the case, are in an extremely unfortunate position.

As with other chronic exposures to agents whose acute toxicity is well known, the effects of chronic lead exposures are often difficult to detect. However, there is evidence that the effects of chronic exposure in malnourished children to substances like lead and oxidants over long periods of time may be insidious. These substances may affect a child by directly inhibiting cognitive and other aspects of psychosocial development because of their neurological action. It is almost

certain that such exposures make a child more susceptible to other diseases like malaria that have a further debilitating effect on overall development. These exposures may also produce other chronic effects that may not be fully realized until later in life.

Conclusion

Poor as it is, the best available evidence indicates that being malnourished and exposed to toxic chemicals is not very good for a child. In the absence of better data, how should we proceed? Must we wait until there are enough dead bodies of children who have died from environmental toxic exposures before we attempt to protect children from toxic agents in the environment?

In the past three decades, India, a country that was used for illustrative purposes in the preceding discussion, has made remarkable strides in producing food. It has also become an industrial and military power and a model to other developing countries. Distribution of income in India and the other poor countries of the world is more badly skewed than in the U.S. Decisions, even in countries with centrally planned economies, tend to be made

along lines of political power, which closely parallel, and are influenced by, the distribution of wealth.

There was a strong and, by all accounts, relatively sincere effort on the part of the Congress Party to redistribute resources after India became independent in 1947. Still, in absolute numbers there are more desperately poor people now in India than ever before. These people may not be as vulnerable nutritionally as their forebears of two generations ago, but they are not in

case. There is increasing evidence that the dominant industrial and agricultural practices of the West are not consistent with maintaining long-term production capability of our resources.¹⁵

It is apparent that after two generations of industrial development in the Third World, some serious health and ecological problems have arisen in the process of creating material benefits for relatively small portions of these populations. The remaining inhabitants of these coun-

development planning can so often ignore this calls attention to the seriousness of the flaws in the decision-making and implementation process.

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Environmental and health effects, because they may be subtle and exert their influence on invisible segments of society, do not enter the balance sheet of cost/benefit analysis.

very good condition either. They are also more likely to be exposed to toxic agents in the workplace or in their environment.

In some respects, industrialization has benefited the developing countries of the world. An effort to hasten the process has been motivated by political factors which call for demonstrable effects in the time-scale of political tenures. This hastening has largely deflected interest in environmental and health issues, especially among the disadvantaged who have little political clout.

Not only are the health issues less visible in the here and now, but they often are deferred in the sense of chronic physiological effects or in lost potential due to such conditions as impaired cognitive development. These effects, because they may be subtle and exert their influence on "invisible" segments of society, do not often enter the balance sheet of cost/benefit analysis.

There is also a pervasive Western, high-technology bias in most third-world development. Because the improved standards of living in the West, especially after World War II, were associated with production and use of toxic chemicals, there is an assumption of a causal relationship. It is becoming apparent that this may not necessarily be the

tries that are not benefiting materially are often being harmed by development processes that are typically poorly conceived, poorly controlled, and poorly monitored.

Crucial to any country's development planning are data concerning all factors related to long-term productive capability. The benefits of high-technology development are usually accepted without critical examination, while ecological and health matters are often completely ignored. If considered, these would weigh heavily on the negative side of the environmental cost/benefit analysis.

It is of utmost importance that this highly politicized development process be fully informed from all technical as well as social, cultural, and economic perspectives. Such factors as human exposures to toxic substances must be considered in development planning. It makes little sense for a society to trade away the health and productivity of its precious human and ecological resources for transitory and very dubious short-range benefits.

Specifically, the matter of toxic exposures among malnourished children is an important problem by itself. It also has powerful symbolic value because of the universal appreciation of children as the future of our survival as a species. That

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INDUSTRY AND HEALTH IN NICARAGUA

War, Technical Aid And Progress

by Charles Piller

The Fabrica National Textiles, known as FANATEX, produces cloth from raw cotton and synthetics. More than 1,000 workers on three shifts labor over row upon row of antiquated machines, refining, weaving, processing and printing huge rolls of fabric.

In the *telores*—weaving room—wall-to-wall machines, 360 in all, operate 24 hours a day. “If you turn sideways, and don’t mind risking your body,” said Buck Cameron, an industrial hygienist for the Teamsters union in Oakland, California, who recently inspected the plant, “you can squeeze between the machines.”

Each time a thread is moved, five times per second per machine, a clanking noise makes its contribution to the almost overwhelming roar. Cameron measured the sound at 98 decibels, nearly four times as loud as the U.S. Occupational Safety and Health Administration (OSHA) limit for an eight hour shift. The workers are slowly going deaf.

But human beings are amazingly resilient, and hearing loss takes

Charles Piller is an Oakland, California-based writer specializing in health issues. He visited Nicaragua during the occupational health conference. His last article for SftP was “Biological Warfare and the New Genetic Technologies” (May-June 1985).

years before it is easily noticeable. Until Cameron arrived, the workers at FANATEX—few of whom are over 40—didn’t realize the significance of their problem.

He came with the first U.S.-Nicaragua Conference on Occupational Safety and Health, held August 17-23. Sponsored by the American Public Health Association’s Nicaragua Technical Aid Project, the innovative event was produced in conjunction with the Nicaraguan ministries of health and labor (MINSA and MINTRAB, respectively, in this acronym-addicted country).

Nicaraguan workers have begun to view occupational health as part of their rightful “social wage,” promised by the 1979 revolution.

Eighteen *norteamericanos* came from across the United States on their own time and money. The group included physicians, an occupational health nurse, a physician assistant, health educators, and industrial hygienists—experts on monitoring and correcting workplace exposures to toxic substances. They tackled 10 industries designated as national priorities by the government.

The FANATEX project included hearing tests for workers and extensive training for Nicaraguan doctors and technicians on how to set up a hearing conservation program. “We didn’t find a solution,” Cameron noted, “but we left people with the skills and understanding to conduct a more effective decision-making process.”

In the industrialized world, high technology and experts are the order of the day for industrial hygiene. Success here was measured in how well the five to 15 Nicaraguans in each project learned new skills, and if they formed a framework to begin to solve the problems. The trainees will now use donated equipment—from simple ear plugs to state-of-the-art sound level meters and spirometers (to test lung function)—and their new skills to train others and expand the occupational health-base.

Nicaraguan Conditions, Nicaraguan Solutions

In the United States, workers often see occupational safety and health as a luxury—an accurate perception, particularly in periods of high

unemployment, when a job can seem worth the risk.

Nicaraguan workers have begun to view occupational health differently, as part of their rightful "social wage" promised by the 1979 revolution. It also includes subsidized food and transportation, and free health services. But conditions in even the dirtiest Chicago steel mills or Detroit auto plants are better than most factories in Managua, Nicaragua's industrial center.

This is a third-world country. Plants are so primitive as to sometimes seem like a lost cause. Occupational health principles we take for granted are unheard of here. And workers are faced with conditions that would be intolerable in Chicago or Detroit.

For example, drivers of ENABUS, the national bus company, suffer stress, as do bus drivers around the world. But stress at ENABUS is in a league all its own, according to Patricia Quinlan, a hygienist from the University of California Labor Occupational Health Program, who

surveyed ENABUS during the conference.

Managua is a city of a million people that relies on about 200 buses. Most vehicles and spare parts are sent to the warfront, so the remaining buses are crowded to overcapacity. Drivers cannot control the crush of humanity. People hang out of windows and cling to the roof and rear bumpers. Sometimes they fall off. After three of these incidents, a driver is fired.

This is one of a multitude of cases in which correct health practices and procedures, as well as standards as we know them in the United States, are so foreign to conditions here that they might as well be concepts from another planet. Prevention is the goal here, but within Nicaragua's reality.

For example, a conference team inspected a furniture factory, finding high noise levels in rooms adjacent to the machines due to a lack of wall insulation. The plant, like most here, was built without the slightest thought to worker health.

The answer proposed would turn a normal U.S. plant manager's hair grey: stuff newspaper in the walls. It makes the plant a tinderbox.

But unlike proper insulation, newspaper is available. It can cut down noise levels. The sawdust and flammable debris inherent in the plant design and work procedures already pose a major fire hazard. The best remedy for both noise and fire is to redesign the entire building, which is financially impossible. The paper solution is far from perfect, but offers help for now.

Such jerry-rigging is something of a national crusade in health care here. Hospitals live by their wits and ingenuity, with makeshift repairs on everything from air conditioners to otoscopes. The concept is just catching on in occupational health. Nicaraguans make do and improve conditions any way they can.

Liz Katz, a hygienist with the California OSHA program, was part of the team which inspected the Willard lead battery plant. She found



Karen Cohn/1985

In the hearing conservation workshop, Nicaraguan health technicians and doctors learned to conduct hearing tests using an audiometer donated by the Technical Aid Project. In their concluding proposal, the team

advocated establishing a hearing conservation program for the textile plant, utilizing education, hearing protection, and job rotation to lessen worker exposure. This worker operates a loom in the weaving

area of the plant, where ambient noise levels reach 90-100 decibels, a level known to cause hearing damage. She was found to have hearing loss in a high frequency related to her occupational noise exposure.

airborne lead levels up to 12 times the California exposure limit. "There was a complete lack of functioning ventilation systems," she said. "Nothing was controlling the hazard." An appropriate ventilation system for a comparable U.S. plant would cost hundreds of thousands of dollars—out of the question here. But what Katz could do was explain how to sweep lead dust properly and what wetting agents to use to keep the airborne levels down, a small but significant step.

The War and Occupational Health

Small wonder why funds are scarce to improve conditions. Forty percent of the government budget goes to defend against attacks by the U.S.-backed counterrevolutionaries, or *contras*, according to Mercedes Tenorio, MINSA representative to the conference.¹

More than a fifth of Managua's health workers have at some time

mits transfer of humanitarian goods.⁴ In reality, all U.S. products are increasingly difficult to obtain. Though shortages have spawned resourcefulness and innovation, they have also devastated the largely U.S.-built industrial infrastructure. Production and occupational conditions have deteriorated badly for lack of spare parts and supplies.

"If something goes wrong with the little occupational health equipment they have, even a minor mechanical problem," Cameron said, "it's useless to them, because they don't have the spare parts or skills to make repairs." Even when parts can be obtained from alternate sources, the lack of foreign exchange caused by the embargo, exacerbated partly by successful U.S. efforts to stop international lending to Nicaragua,⁵ makes needed supplies unaffordable. Things as basic and relatively inexpensive as hearing protectors, at \$20 per worker per year, are out of reach. "When you barely have funds

tremendous responsibilities they are given. Oscar Barrios, head of the occupational health section of MINTRAB for six years, took the job when he was in his early twenties. Roberto Ruiz, 42, director of MINTRAB's occupational health lab, is known as the "old man" of the section.

Young people are remaking the country. The vigor they show is intoxicating. It is hard to visit without feeling exhilarated by their achievements. The most striking example was the literacy campaign of 1980. Thousands of students took to the provinces for six months to teach Nicaraguans to read. Illiteracy dropped to 13 percent from 50 percent.⁶ And under the Sandinistas, the student population has more than doubled to 1.1 million.⁷

Occupational problems may seem insurmountable, but public health gains show that major improvements are not out of the question. Starting with some of the worst infant mortality and preventable-disease rates in Latin America in 1979, changes were so dramatic that Nicaragua won the 1982 World Health Organization prize for greatest achievement by a third-world country.⁸

"We started with only four inspectors in 1979," Barrios said in a 1983 interview. "We were up to 62 in 1982, with 15 more coming in the first six months of 1983, all of whom have had almost four years of training in occupational safety and health (primarily in Cuba and other friendly nations)."⁹ Although the war has cut into this progress, it indicates that improving conditions is a high priority. And it reflects the determination that created a successful conference in the face of major economic, logistical and communication obstacles.

The conference's success was also due in large part to cooperation among labor unions (both Sandinista and independent), management, local professionals, and the government. Workers, doctors, and plant managers in private and government plants were trained together for what they seemed to see as a common goal.

Not that everyone in the country agrees that things are being run properly. The ENABUS drivers, represented by one of the non-Sandinista unions, said conditions were as good or better under former dictator Anastasio Somoza Debayle, who owned the company before the revolution. In addition to the stress of their work, they don't have ade-

Starting with some of the worst infant mortality and preventable-disease rates in Latin America in 1979, changes were so dramatic that Nicaragua won the 1982 World Health Organization prize for greatest achievements by a third world country.

been mobilized to serve on the war fronts, and many were among the roughly 7,000 Nicaraguans killed by the *contras*.² Since 1981, more than 50 health facilities have been destroyed during these attacks.³ Since those in the occupational health apparatus tend to be solid backers of the revolution, many volunteer for military duty, leading to tremendous problems of continuity and training in the fledgling bureaucracy.

Occupational health supplies fall into a grey area of the trade embargo imposed by the Reagan administration last May, which per-

to keep the plant running," Cameron said, "it seems like a luxury."

The Nation's Priorities

Nicaragua's problems and hope for progress in occupational health can only be judged in the context of its exceptional youth. Nearly 50 percent of the population is under 15. This is reflected in a reverence for the young here, many of whom sacrificed their lives during the veritable insurrection of teenagers in 1979, and since then, fighting the *contras*.

Respect for youth is clear in the



The construction safety workshop went to the field on several occasions to learn by doing, focusing on topics of trenching and shoring, scaffolding, and crane safety. In this photo, inspectors of the Ministries of Labor and

Construction examine a 25 ft. deep unshored pit, dug to hold the concrete foundations of lighting towers for Managua's stadium. The site revealed a lack of materials and equipment to properly engineer the pits.

quate time for rest breaks or sanitary restrooms and facilities for cooking meals, according to Quinlan. "They complained bitterly that MIN-TRAB studies their problems and complaints, but never does anything to correct them." When young people run a country, the lack of management experience can create as many problems as youthful vigor overcomes.

Teaching Workers

Unlike public health, technical understanding in the occupational arena is meager. As far as conference

participants could determine, there is not a single hygienist in Nicaragua qualified to practice by U.S. standards. The entire occupational health infrastructure has been formed since 1979. The Nicaraguans consumed conference information like a famished person eats.

U.S. conference planners took into consideration this meager theoretical base and devoted much of the training to everyday problems. This meant giving the workers themselves access to the information that could improve their conditions.

"In our country we have a medical elitism. Docs seem to think medical information is theirs, and the patients accept that," Cameron said. "But in Nicaragua," he added, referring to the audiometric testing of textile-workers, "we found a more natural inclination to share as much information as possible." The workers got the information they needed to know about why they should care about ear plugs, before it was too late.

The lack of basic information promotes practices which exacerbate occupational exposures. The conference trainers noted with frustration that even though post-shift showers and clothing changes were available at some plants, workers often refuse to use them, taking home toxic substances on their clothing to share with their families. The

showers are cold, and workers irrationally fear contracting arthritis from the chill.

Part of the challenge is to engender understanding of the value of reducing toxic exposures in a society that lives with much more immediate dangers. Most visitors here notice one manifestation of how difficult this can be: virtually everyone over 14 smokes cigarettes. But no one worries about getting lung cancer at age 65. Only about two percent of the people ever get that old.¹⁰ Although life expectancy has increased recently to about 59, the smoking culture was firmly established under Somoza, when health services were unavailable to most people and life expectancy was about 52.¹¹

Filling the Information Gaps

Managua's physical layout shows how valuable elementary suggestions can be when the information vacuum is so large. The city is unlike any other national capital. Almost totally destroyed by an earthquake in 1972, it was never rebuilt. Millions of dollars in international relief were siphoned off by Somoza. Many remaining buildings were

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Can You Help?

The conference coordinators are attempting to follow up by keeping supplies flowing to Nicaragua. Donations of all manner of occupational health supplies and educational materials, particularly Spanish translations, are urgently needed. To donate supplies or for more information on future technical aid trips, contact the Nicaragua Technical Aid Project, c/o Catherine Sonquist, 3024 B Fulton St., Berkeley, CA 94705, (415) 848-2025.

bombed by his air force when he fled during the insurrection. The result is a "city center" sparsely dotted with low-rise buildings and the shells of destroyed towers, separated by empty lots of hundreds of yards long.

"Eventually the downtown is going to be rebuilt," said Scott McAllister, also with California OSHA, who worked on the conference's construction project. "And they are going to pour concrete for all of it." Their methods for doing so, he added, are nothing short of terri-

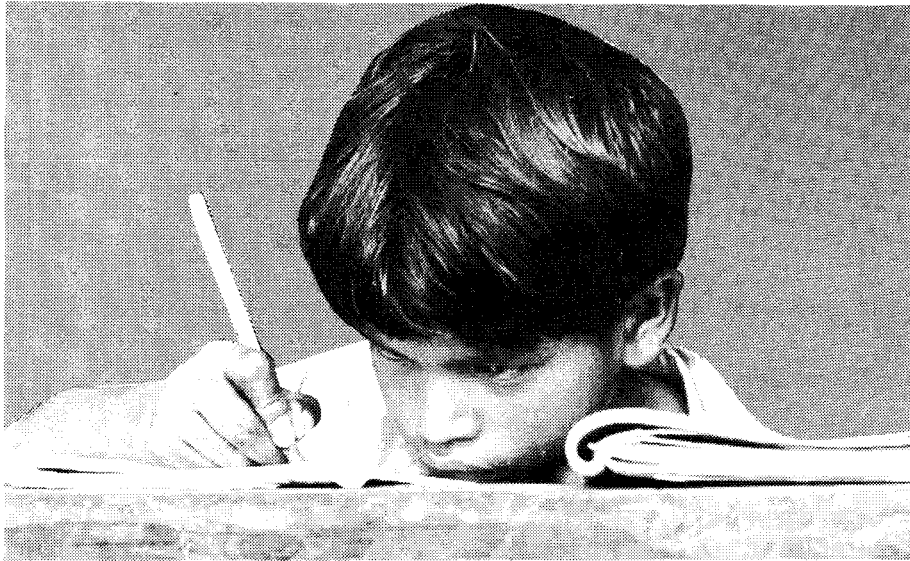
fyng and lead to many preventable deaths.

"Concrete buildings in this kind of earthquake country have deep foundations," he said. "Cranes fall over and trenches cave in. There were 15 Nicaraguan safety engineers in the project, who now have a way to safely approach trenching and shoring for heavy construction." McAllister and co-trainer Tony Warman, a manager of the Granite Rock Construction Co. in Santa Cruz, California, made a commitment to help their group establish a crane

certification program and new national construction guidelines.

In the face of economic crisis and war, it is easy to wonder why the Sandinistas are devoting any attention at all to occupational safety and health, particularly with the openness a successful international conference requires. "What other country at war would ask you into their factories, let you talk to the workers, and let you take pictures?" Merri Weinger, a health educator and conference organizer asked.

"The Sandinistas realize they've got to have popular support to survive the attacks by the Reagan administration," said McAllister. "They know they've got to come through on the promise of improved working conditions for their very survival." Despite determination and technical aid from around the world, it is apparent that the war and embargo are taking their toll. Conditions are worsening steadily here. The ultimate question is not whether the Nicaraguans will succeed in improving the health of their workers, but whether the country will survive the aggression long enough to have an honest chance to try.



Daniel Sumar

Dear Americans, Ocotal, Nicaragua
 When I was 4 we didn't have any schools or doctors or land to grow food. That's why my family fought against the dictator Somoza. But now your government is trying to destroy all we are building. Everyone says the American people are good. They say if you knew what was happening you would stop the war.
 Please Stop This War and Give Me and My Country a Chance to Grow.
Your friend,
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OPINION

continued from page 7

So the Green Revolution involved not just an ecological revolution, but also an industrial one. And it was the industrial revolution, with the need for new chemicals, that led to the creation of the Union Carbide plant at Bhopal.

If the Green Revolution was hardly green, it did succeed in other ways. It provided employment for people, and jobs away from the land. And in some cases it provided increases in agricultural productivity.

But the successes of the Green Revolution must be measured against its failures. It replaced a potentially self-contained subsistence agriculture system with one dependent on outside resources. Those resources became part of the market economy, available only to those with the financial means to afford them. It suggested that agricultural productivity could be enhanced through applications of herbicides, pesticides, and fertilizers. It claimed that increased use of those chemicals could expand productivity even more.

The Green Revolution made the agricultural system a part of the larger world industrial system, rendering it susceptible to all of the economic, and especially financial, instabilities of that system. And most significantly, it created an agricultural system that treats the environment as a resource that humans can manipulate with utterly predictable results.

Bhopal is a side effect of that system. Other possible side effects include the corn blight in the West during the 1970s, Love Canal, and the recent rash of credit-induced farm foreclosures in the U.S. More closely related consequences include Union Carbide's subsequent fiascoes: the release of toxic gases in West Virginia and the contamination of watermelons in California. And they can be seen in a variety of other situations less close to home—in the destruction of forests in South America, in the reliance of some countries on export cash crops while people at home starve, and in the development of nuclear power in less economically developed countries.

Each of these cases is tragic evidence of the dangerous power of the Western model of development, just as each reminds us of the absence of serious consideration of alternatives. Advocates of alternative models are

manifold, from nineteenth century environmentalist anarchists like Peter Kropotkin and Elisee Reclus to contemporaries like E.F. Schumacher, Robert Theobald, and Amory Lovins. They—and many more unnamed here—have reached within themselves to discover an image of a better world, a world where people control their own lives, and where the aftermath of economic development can include more than the fear of its side effects.

Attempts to industrialize the world on the Western model may succeed partially, but the human cost will be great. Within such a system there will be no real accidents, but only anticipated risks and consequences.

To choose the Western path of development is to choose a path in which Bhopal is history, but also the future. But if we look carefully at this tragedy and its brethren, we can begin to discern not only the paths which we should avoid, but also the directions in which we should go—and the actions that we should take to get there.

BHOPAL

continued from page 11

fertilizer plant and the nuclear reactor are all Indian government undertakings.

Since no provision is made to provide accommodation for the the low-paid employees of these plants, they tend to live very close to the factory in small huts. Eventually, these huts become part of the shanty town or a colony. In the case of the Union Carbide plant in Bhopal, when the plant opened there was vacant land around the factory. The land was then settled by juggi dwellers and unauthorized construction. Not until May 1984 were a large number of the unauthorized tenements and settlements in Bhopal regularized by the state government.

Western Technology in an Indian Context

In spite of the total ban on asbestos manufacturing plants in the western world, two multinational companies, in collaboration with Indian firms, still manufacture asbestos in India. More than 400,000 tons of asbestos cement were produced in India last year. One asbestos plant is situated in a densely populated area in Bhandup, Bombay, and children play

with asbestos waste that the company throws away.

Bhandup is also home for many pharmaceutical companies, engineering firms, dyestuff and chemical plants. Ciba-Geigy, Guest, Keen and Williams, and Automobile Products of India are located there.

There is no reason why the British company Turner and Newell should operate its asbestos plant in India. A foreign company setting up a potentially dangerous factory overseas ought not to be bound by local customs and practice, but by the health and safety regulations that would be imposed in their home country. If such criteria were adopted by the British companies in India, several factories ought to have been closed a long time ago.

The export of advanced technology is inappropriate when science and technology, even in their crudest form, have not reached the masses of Indian villagers for whom hunger and starvation are an everyday reality. The Bhopal disaster indicates that the import of western technology creates dangers of such intensity and produces such a high level of neurosis for populations living near these industries, that it cannot possibly serve as a model to be imitated by India.

Basic science and technology are not oriented towards the needs of Indian society, and most Indians are isolated from technological development. More than 60% of the Indian population are illiterate, to whom advanced technologies such as space and nuclear engineering have no meaning. If people had realized that they were living very close to a dangerous chemical plant, hundreds of lives would have been saved. But most Indians have not been taught that high technology involves risks or danger, so workers at the Bhopal plant were slow to appreciate the scale of peril.

What the planners fail to realize is that the required resources for India cannot be mobilized via the technology of the affluent society, which is immensely capital intensive and labor saving, and dependent on an elaborate infrastructure that is enormously expensive. Uncritical technology transfer from developed nations to India promotes a lifestyle which suits the tastes of small, rich minorities, but condemns the great majority to increasing misery. An appropriate technology would be indigenous, responding to the economic and social needs of society, instigated and initiated by the users of the existing technology.

The Export of Hazard Transnational Corporations and Environmental Control Issues

Jane H. Ives, editor
Routledge & Kegan Paul, 1985

by Dan Wartenberg

International transport of hazardous chemicals has long been an issue of concern to public health scientists and others concerned with issues of international health.

Recently, the tragedy in Bhopal and the increased reporting of toxic chemical spills and releases within our borders has heightened public awareness. Many of us are reevaluating our own thoughts on this problem and asking ourselves about the ethical and moral implications of exporting hazardous chemicals. It's time to reexamine the double standard which contends that third world countries are maliciously exposed to greater hazards than the exporting nations.

With these issues in mind, Jane Ives's new book, *The Export of Hazard: Transnational Corporations and Environmental Control Issues*, is a welcomed contribution to the discussion of toxic chemical transport. The book is a series of articles by experts in the public, private and academic sectors discussing occupational health and safety, public health, international relations and regulatory issues related to hazardous chemical exports. The ideas first were presented at a symposium in November, 1979, and refined over the past few years.

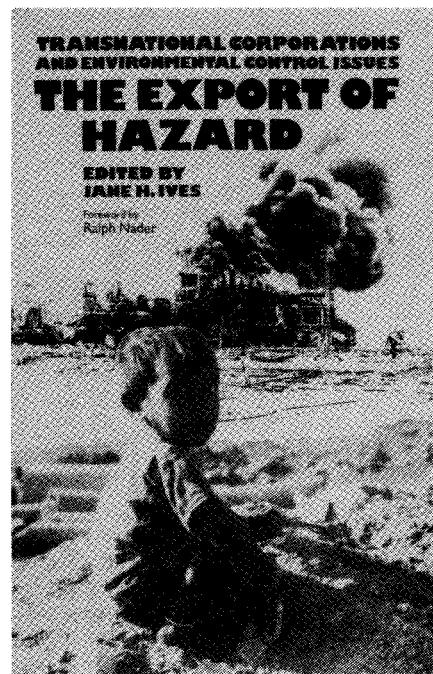
The book provides valuable resources as well as important discussions on a variety of topics. Susan King and Andrew Waldo each review aspects of existing and pending U.S. legislation and international agreements on exportation of hazardous material. The legislative considerations range from notification of the receiving government to written approval of the

shipment by the foreign government and providing informative fact sheets on the hazardous shipments. Strict controls of exports are also discussed, whereby chemicals deemed too dangerous for use in the exporting country cannot be shipped elsewhere.

Ives reviews some cases histories of health effects of technology transfer and Rashid Shaikh provides a bibliography of materials related to many aspects these issues. Some of the articles discuss the export of hazardous waste, a practice far more suspect than the export of dangerous chemicals which can be used for some positive purpose.

Waldo suggests that one way to reduce risk is to regulate the transport of hazardous materials internationally. He argues that universal, international responsibility and standards along with easy access to information about the dangers of the exported chemicals would be extremely beneficial in controlling risk. Sheila Jasanoff suggests, in this vein, some specific international arrangements for the compensation of victims of pollution and hazardous products.

Barry Castleman claims that increased regulation within developed countries will merely drive hazardous industries abroad to less developed countries with less stringent occupational health, safety and environmental regulations. He sees the need for international standards rather than more stringent U.S. standards. In this volume, Levenstein and Eller and Michaels, Barrera and Gacharna disagree with Castleman's thesis, suggesting that other factors such as available la-



bor, wage scales, and proximity of raw materials are far more important, if indeed this exodus is occurring. They agree with the need for international regulation, but do not accept the premise that stringent U.S. regulations are a driving force in the export of hazard.

Ruth Ruttenberg asks a philosophical question central to the export of hazard: whose values, customs, and ethics should be used in evaluating danger and safety in importing countries? Consider an extreme case. Is it chauvinistic of the U.S. to evaluate hazard in less developed countries based on its own values and ethics? Is it moral to deny to a country that is experiencing the ravages of a malarial outbreak the use of the most efficacious pesticide available to save lives—DDT—when that chemical will have a long-term impact on the environment and the people exposed to it? Is it worth saving lives today and dealing with the environment after this immediate crisis has passed? Or, since we have more knowledge and experience with the application of these chemicals, can we in the U.S. make this judgement for less developed countries? Ideally, effective alternatives to the use of hazardous chemicals would be offered.

But often, there is not time to devise such alternatives or to teach others adequately in their application.

In some such instances, risk-benefit analyses may be suggested to evaluate these choices. Nicholas Ashford argues strongly that such an approach is untenable. The risk and benefits are incommensurables. There is poor accounting for long-term effects and socially unequal allocation of the risks and benefits. Alternative strategies are not included in the calculation. Ashford acknowledges the right of the less developed countries to make their own choices but points out that as a nation we must help them overcome information gaps which are often exacerbated by profit-hungry corporations looking for new markets.

David Noble and James Weeks argue that the issues are not conflicts between rich and poor countries but rather between the residents of these nations and the multinational corporations that control resources and economic decisions within their countries. They each argue for a fundamental reevaluation of economic and capital resources as a means of addressing this issue.

Another philosophical issue, which Castleman argues, is whether the health and safety standards used in the importing countries are far more lax than in exporting nations. Is this the cause of many mishaps related to these less stringent guidelines? It is clear, as Castleman documents, that health and safety standards often differ from nation to nation. What is less clear is how this variation relates to the causation of industrial mishap. This is the so-called double standard.

In the aftermath of the Bhopal disaster, many claimed that the catastrophe was due to the less stringent health and safety regulations imposed on Union Carbide in India—the purported double standard. But less than one year later, we have had major leaks from UC's Institute, West Virginia plant and disclosures from a Congressional investigation of hundreds of other releases throughout the U.S. Is the alleged double standard really to be blamed, or are health and safety standards so lax everywhere that these accidents just occur?

Because of the urban, social and culture environment around the Bhopal plant, the human toll from

this leak was severe. But would a similar leak in New Jersey not have similar cataclysmic consequences? While the double standard does exist in some cases, the more fundamental issue of safety of hazardous chemical facilities worldwide seems more basic. A recent report by the International Confederation of Free Trade Unions argues that despite the technical design flaws and poor safety and maintenance records at

the Bhopal facility, adherence to U.S. standards would not have averted this disaster. The accidents didn't happen because we're safe and they're not. No one is safe.

Dan Wartenberg is a research fellow at the Harvard School of Public Health and a long-time member of Science for the People. He frequently writes on pesticides and environmental issues for SftP.

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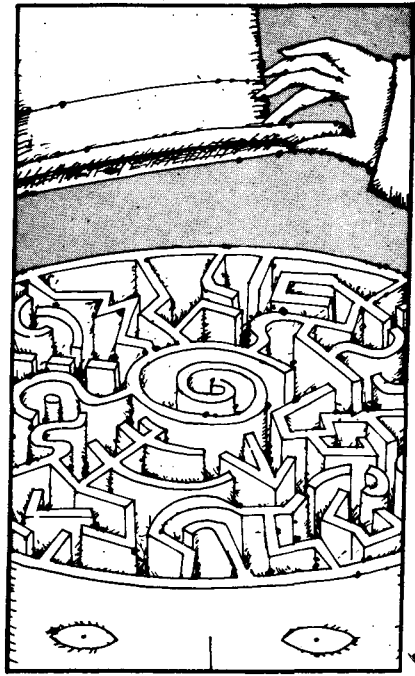
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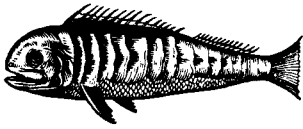
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Not In Our Backyards! Community Action for Health and the Environment

by Nicholas Freudenberg

Monthly Review Press, 1984. 304 pp., \$10

All too often, critics dismiss local environmental groups who are concerned about the dangers of hazardous waste dumping or chemical emissions as deranged and rabid carriers of NIMBY. In our democracy, they remind us, we all must make some sacrifices for the common good. Therefore, neighbors who reject hazardous activities that benefit the larger society are selfish and shortsighted.

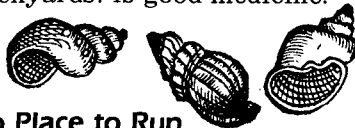
Environmentalists are now examining this Not-In-My-Back-Yard syndrome in a new light. Thousands of people in every state are finding that their backyards are the waste dumps of industry. And the citizens who organize their neighborhoods to respond to these hazards are discovering that the problems in their communities are widespread. Saying "not in my backyard" to chemical hazards may be the only way to protect all of us.

Freudenberg's book is a valuable primer for the seasoned or neophyte activist who wants to protect their health from chemical trespassers and promote more effective national and state legislation. It begins with a discussion of the nationwide contamination of our air, soil, water, and food by toxic substances. Freudenberg then examines the limits and accomplishments of scientific research and outlines the mechanisms which are already in place to regulate these contaminants, and how they fall short.

The greatest portion of the book is devoted to case histories and strategies for making changes at the

community and national level. Practical information covers litigation, community organizing and education, researching environmental hazards, and building stable organizations and coalitions. The final chapter proposes suggestions for joining grassroots activists and national environmental groups into an effective lobbying and political force.

If you feel yourself coming down with a case of the NIMBYs, or want to join the thousands of others who are trying to protect our health and environment from chemical intruders, *Not In Our Backyards!* is good medicine.



No Place to Run Local Realities and Global Issues of the Bhopal Disaster

by Anil Agarwal, Juliet Merrifield, and Rajesh Tandon

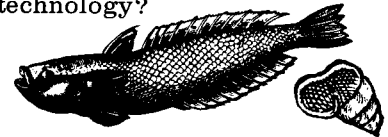
Highlander Center and the Society for Participatory Research in Asia, Rt. 3, Box 370, New Market, TN 37820, 1985, 40 pp., \$5 (plus \$1 postage)

Hazardous industries cover the globe. This report places Union Carbide on the map of diversified multinational producers and links Bhopal to a world full of chemical killers.

No Place to Run is the product of international collaboration and research. After describing the events surrounding Bhopal's deadly gas leak, the authors analyze Union Carbide's operations worldwide. They portray a corporation unwilling to uniformly regulate its deadly business without government monitoring and enforcement. Profiles of Union Carbide operations in Indonesia, Puerto Rico and the U.S. describe their products, accident and hazardous emission records, cancer rates and illness resulting from environmental pollution.

The final section of this report probes the global

management and control of dangerous industries. How can hazardous industries be made safe? Do we need their pesticides and dangerous products at all? Are there safer forms of international development, industry and technology?



The Trade Union Report on Bhopal

International Confederation of Free Trade Unions and the International Federation of Chemical, Energy and General Workers' Unions

ICFTU, Rue Montagne Aux Herbes, Potageres 37-41, 1000 Bruxelles, Belgique, July 1985, 20 pp.

After a methyl isocyanate leak in October 1982 that injured three workers and affected neighboring residents, workers at the Bhopal Union Carbide plant warned the community and fellow employees of future accidents. They distributed hundreds of Hindi language posters throughout the community reading, "Beware of fatal accidents.... Lives of thousands of workers and citizens in danger because of poisonous gas.... Spurt of accidents in the factory, safety measures deficient."

The trade union report shows how Indian and U.S. Union Carbide officials failed to correct operating and maintenance procedures which led to the fatal release of poison at Bhopal. Unsafe process design, faulty equipment, and cutbacks in staffing levels and worker training all contributed to the disaster.

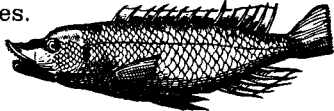
The trade union investigation reveals that the factors leading to the Bhopal accident weren't unique to Union Carbide's plant, but common to chemical and other industrial processes throughout the world. They describe conditions at the Bhopal plant in relation to chemical production in other countries and corporations.

Dumpsite Cleanup: A Citizen's Guide to the Superfund Program

Environmental Defense Fund Toxic
Chemicals Program

1525 18th St. NW, Washington, DC 20036,
1984, 188 pp.

Here's a useful handbook that teaches citizens how to take control of their environmental health. In plain English, it discusses the scientific and technical issues involved in assessing the health risks at a hazardous waste site and taking remedial action. It further highlights the legal bases for confronting hazardous waste polluters, emphasizing tactics and strategies that prevent damage to ecosystems and people. An extensive resource list is also included. Much of the information could easily be applied to other pollution battles.



A Citizen's Handbook on Groundwater Protection

by Wendy Gordon

Natural Resources Defense Council, Inc., 122
East 42nd St., New York, NY 10168, 1984,
208 pp.

This is probably the most complete handbook available on what citizens can do to protect threatened and often neglected groundwater. It acquaints the reader with the hydrogeological, ecological, and health issues necessary to comprehend the problem and take effective action. A short section details the process of getting water tested and projecting the scope of a potential pollution problem.

The bulk of the book guides the reader through the legal maze relevant to groundwater. A concluding section includes valuable charts, review questions, information on government environmental agencies, a glossary, and an extensive bibliography broken down by subject.

Not An Easy Choice A Feminist Re-examines Abortion

by Kathleen McDonnell

South End Press, 1985, 157 pp., \$8



Not An Easy Choice raises issues often skirted by the pro-choice movement. They're not easy questions: What roles should men take in abortion decisions? How do feminists respond to the profound grief and pain experienced by many women who have abortions? Are there other options for pregnant women whose partners flee or demand that they have an abortion? Why is the anti-abortion movement predominantly women? Can a woman be a feminist and oppose the right of other women to choose abortion? How can pro-choice advocates differentiate quality-of-life from right-to-life issues? How should we respond to social pressures to abort—or bear—abnormal fetuses who would be born physically or mentally disabled?

Kathleen McDonnell writes from her experience in the Canadian abortion rights movement. Her book reaffirms the need for abortion options in a world that still punishes mothers and their children with futures of poverty, isolation and self-sacrifice. "In unchosen pregnancies, women may deeply regret that they are not in a situation which would allow them to raise a child," writes a Toronto childbirth educator and midwife, "...it is not clear that they don't want a child, it is clear only that they cannot raise a child in the situation our society puts women in."

McDonnell places abortion in the framework of reproductive and economic options that exploit women. She examines contraception, childbirth, genetic engineering and adoption processes which are still inhumane, sexist, and poor choices for many women.

"I do think we have a right to

choose whether or not to have children," one woman states. "But for many of us our class and economic background pretty much make the choice for us. We don't really have the free choice to have children when we want them." We need better options and equal choices.



Asia-Pacific People's Environment Network (APPEN)

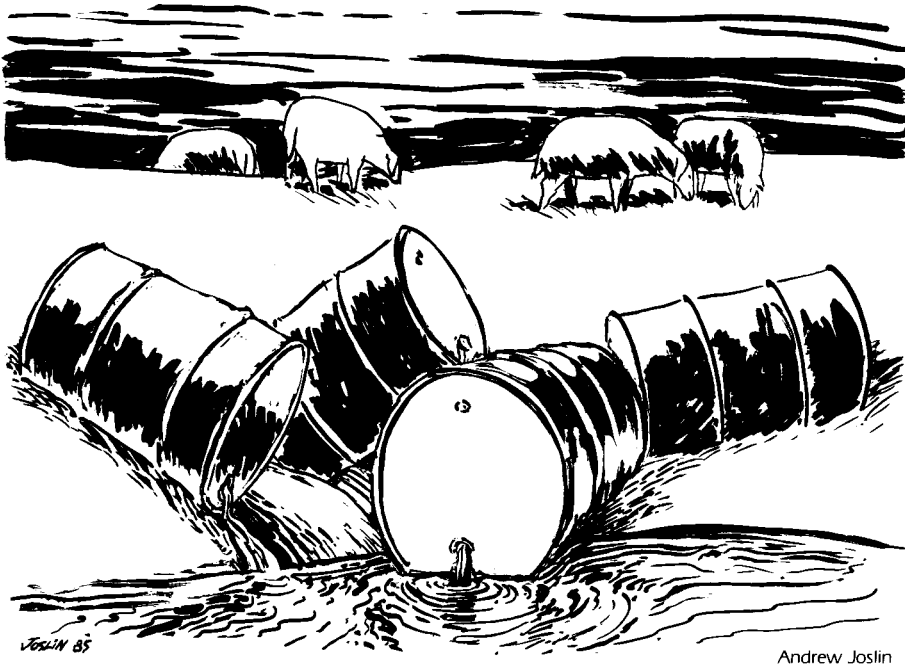
Sahabat Alam Malaysia

37, Loring Birch, Penang, West Malaysia. Tel:
376930

The Asia-Pacific People's Environment Network is a coalition of over two hundred groups formed to advocate for environmental reform. They are calling for support of the United Nations Consolidated List of Hazardous Products and protesting the United States vote against this list. The consolidated list was initiated by consumers and governments seeking information about pesticides and hazardous substances that are marketed in their countries but banned or restricted elsewhere. The U.S. was the only country to vote against the hazardous products list.

Though underdeveloped countries use only one-sixth of the pesticides produced worldwide, they sustain at least half of the 750,000 poisonings and over two-thirds of the 13,800 yearly fatalities. APPEN asks proponents of the U.N. hazardous products list to send support letters and cables to the Secretary-General of the United Nations, New York, NY 10017. Letters and cables protesting the U.S. veto should be sent to President Reagan and U.S. ambassadors internationally.

Sahabat Alam Malaysia coordinates APPEN and also publishes the bimonthly *Environmental News Digest*. Foreign subscriptions cost \$30 a year.



Toxic Ireland

by T. Jones

Dublin, Ireland

The consequences of a development policy which ignores the question of environmental degradation are now beginning to surface in Ireland.

Ireland's development policy has been based on attracting multinational corporations, particularly in the pharmaceuticals, fine chemicals, and electronics sectors, with tax breaks, grants, access to European Economic Community (EEC) markets and other incentives.

As a consequence of this policy, Ireland has become a favored location for U.S.-based multinationals, with return on U.S. capital invested here being among the highest in the world. As a result, Ireland is now the tenth largest pharmaceutical exporting nation in the world, with most of the major U.S. drug firms having production facilities here.

As well as the tax breaks, lack of environmental and health and safety regulation is another major attraction for U.S. capital. This is no small enticement when safety ex-

penditure can add as much as 20 percent to the capital costs of chemical factories.

Ireland's lack of regulation in these areas is notorious. Petra Kelly of the West German Greens has accused multinationals of using Ireland as a pollution haven, as have various Irish environmental groups. Chemical industry magazines have reported that companies find Ireland a good place to do business in this regard, with state and local authorities being extremely sympathetic to companies in regard to environmental problems.

This sympathetic attitude is shown by the fact that until quite recently the chemical division of the Department of Labour was as good as inoperative, with only one part-time official assigned to it. Nor has the Irish government made any decisive moves towards introducing the EEC Seveso Directive, requiring companies to provide information and evacuation plans for areas close to factories defined as major industrial hazards.

A lack of toxicological expertise, which has been pointed out in a report by the National Board for Science and Technology, combines

with a lack of political will to regulate for fear of scaring off further multinational investment. This leaves the Irish people virtually unprotected from toxic industry.

The human consequences of this development policy are exemplified in what has happened to one farming family in County Tipperary. For five years, John Hanrahan and his family have been suffering from the effects of pollution from the Irish subsidiary of Merck & Co., Inc.

Merck's Irish plant, whose holding company is registered in Bermuda, began operating in Ballydine in 1976, when it suffered the first of three explosions that have occurred at the plant. From 1980 on, animal and human health problems began to be reported in the area, which local people associated with emissions from the plant.

Political pressure led to various government and semi-state bodies investigating the problems, but all these studies were focused on exonerating the factory. Even when one study made a tentative correlation between chronic levels of pollution in the area and the Merck plant, the local authority used the study to claim no connection had been established and to cease monitoring the area. When fear of dioxin pollution forced the government to test emissions from the factory's incinerator, the report found no major problems.

Earlier this year, Mr. Hanrahan brought a case against Merck in the Irish High Court. Various witnesses gave evidence of pollution in the area, deaths and deformities in Mr. Hanrahan's cattle, and illnesses consistent with exposure to environmental pollutants in the Hanrahan family. The judge decided that Mr. Hanrahan had failed to prove the factory was responsible for ill health among his family and his farm animals, though admitting that evidence of botanical pollution was established, and dismissed the case.

The court heard disquieting evidence of Merck's operation of its toxic waste incinerator over the years when Mr. Hanrahan and other locals were suffering from health and farm problems. Merck admitted in court that the incinerator had operated for large periods of time below the required operating temperature. Merck agreed that this

would result in increased chemical emissions but claimed these were inside "acceptable" levels. Unfortunately, Merck had no way to prove this since they didn't monitor emissions from the incinerator until 1982.

Irish environmentalists have pointed out that problems similar to those experienced by Mr. Hanrahan and his neighbors have been reported around toxic waste incinerators (also alleged to have operated at insufficient temperatures) at Bonnybridge in Scotland, Pontypool in Wales, and Baton Rouge in the U.S. Evidence which didn't support Merck's case was not reported by the Irish media, and some journalists have admitted privately that coverage of the case was censored.

Three other points deserve mention. There is no doubt that the implied threat that Merck would close its factory, throwing 200 people out of work in a time of high unemployment, had some influence on the court's decision.

In addition, the resources available to both sides in the case were highly unequal. John Hanrahan is now facing financial ruin because of legal and other costs, estimated at \$1 million. Merck, which was supported by major government departments in making its case, estimates its profits from the Ballydine plant as \$1 million a week. Finally, the general difficulty in proving cause and effect in pollution cases was aggravated by inadequate experience with such cases in Ireland, by the lack of a contingency fee system, and by insufficient local scientific and toxicological expertise.

John Hanrahan has been forced to sell his herd and machinery at knock-down prices to finance his appeal. He is also attempting to sell his farm to pay off legal and other costs.

Meanwhile, some 35 miles away, pollution from a tailings pond of an abandoned mine developed by the Canadian multinational Mogul is threatening farms. Farmers around the semi-state NET fertilizer plant are reported to be suffering from pollution problems. Still, the Irish government continues to invite in multinationals with little thought for their environmental impact.

Their latest catch is Advanced Micro Devices, a major electronics corporation which has created pollution problems in California. They're being sued by ex-workers for damage to their health from exposure to toxic chemicals.

Network



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